# SCIENTIFIC AMERICAN

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## THE NEW EAST RIVER BRIDGE.

The promoters of the great and costly suspension bridge which forms the central subject of our front page illustration are abundantly warranted in their enterprise by the statistics of travel over the existing bridge across the East River, New York, which was opened some thirteen years ago. The total number of passengers to cross the bridge during the first year, 1883-1884, was 8,823,000. In ten years' time the total had grown to 43,000,000—an increase of 500 per cent; and to-day the capacity of the cable road is quite inadequate to meet the increasing volume of traffic. The intervening quarter of a century since the commencement of work on the Brooklyn Bridge has seen a great change in the problem of transportation between New York City and Brooklyn. Undoubtedly the location was a good one for the needs of the two cities as they then existed. The Brooklyn approach on Fulton Street connected with the main artery of travel in that city, and the City Hall Park, on the New York side, might be reasonably supposed to represent a central point between the downtown business center as it then lay and the possible future developments on the upper part of Manhattan Island. So rapid, however, has been the growth of the two cities in a northerly direction that the present bridge now lies far to the south of the center of population, and for some years there has been an urgent need for another bridge to the north of the present structure.

The Brooklyn Bridge, moreover, labors under the disadvantage that it has no through connection with the elevated and surface railroads of the two cities, an evil which not only delays and inconveniences the passenger, but seriously limits the capacity of the bridge itself, inasmuch as its carrying power is determined by

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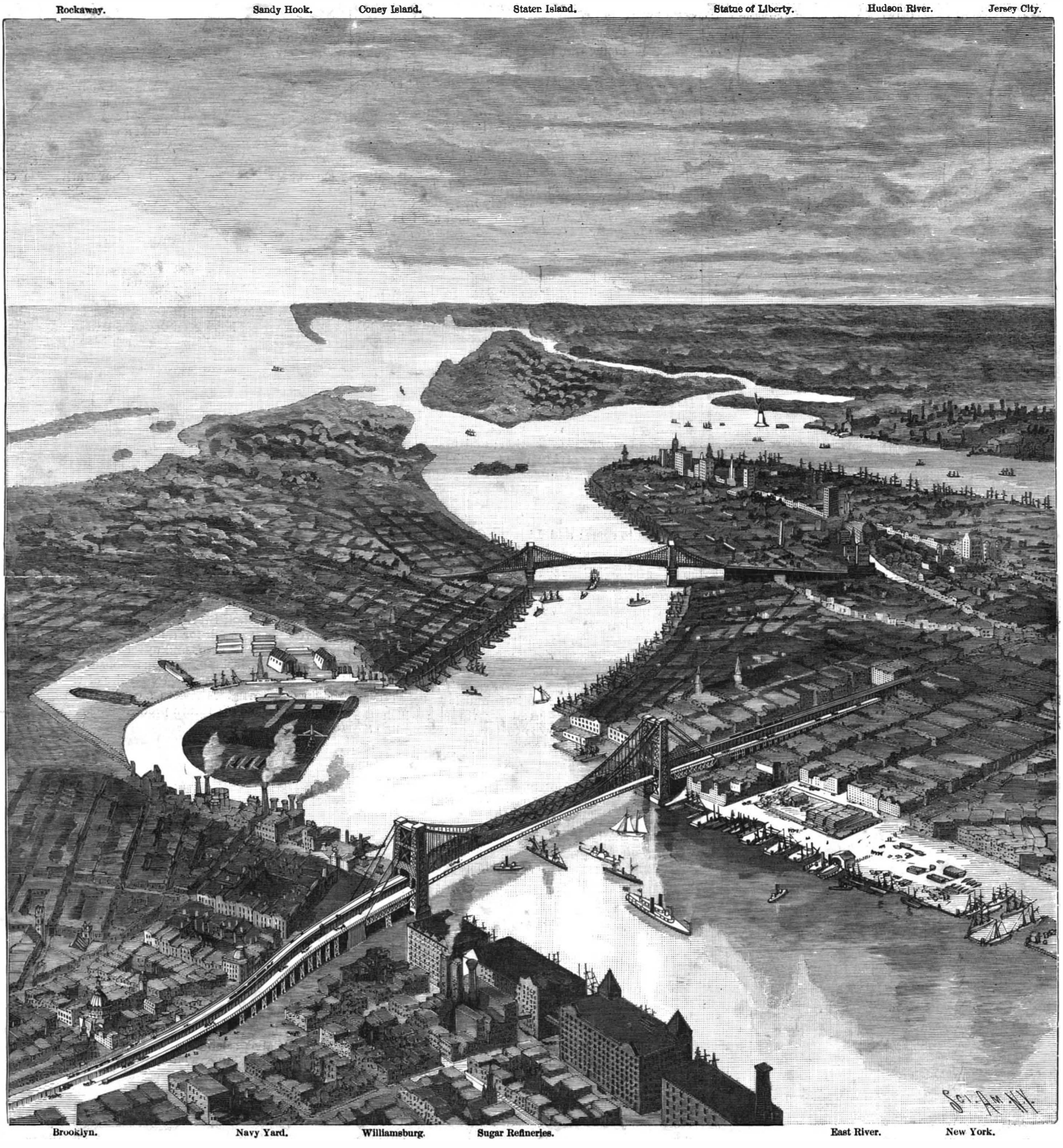


NEW EAST RIVER BRIDGE CONNECTING NEW YORK AND BROOKLYN.

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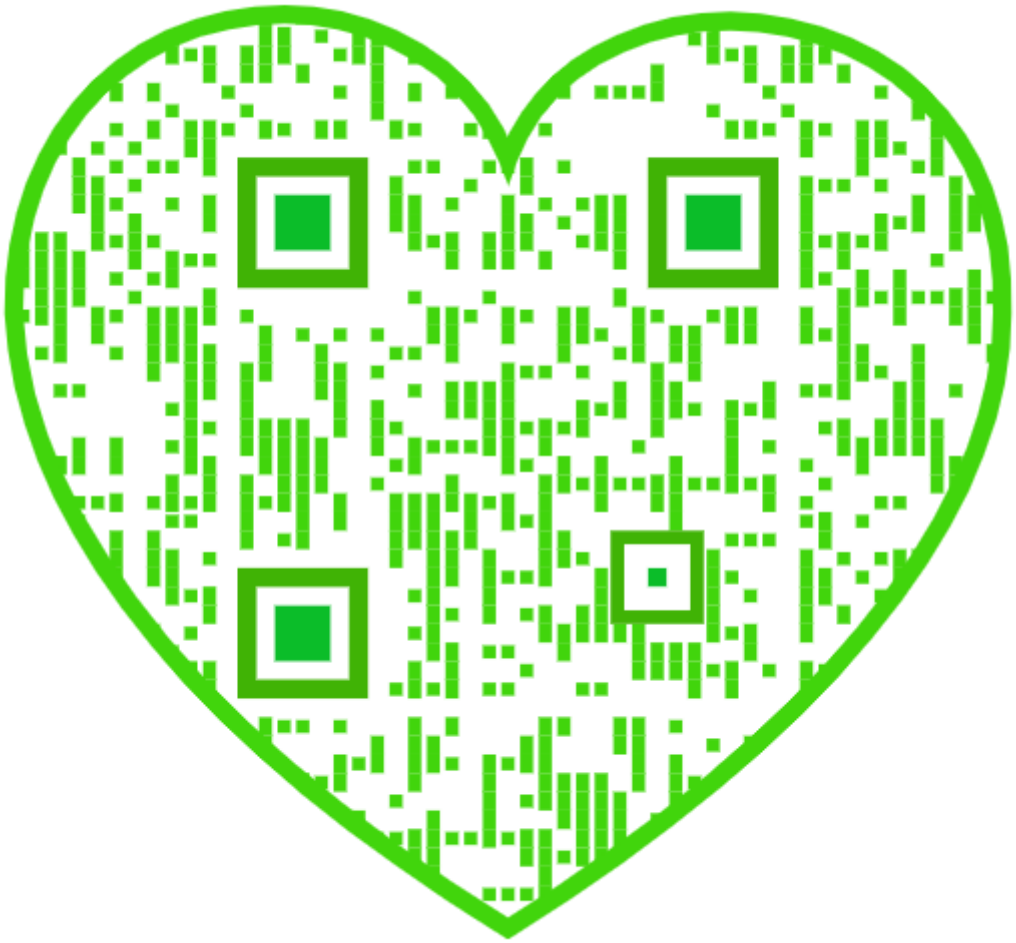

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## LI HUNG CHANG AND OUR COMMERCIAL RELATIONS WITH CHINA.

To any thoughtful observer of Li Hung Chang, the distinguished statesman, who is at present the guest of the United States government, it is evident that whatever diplomatic purpose may lie behind his visit, it is largely prompted by the desire to examine our commercial and industrial conditions, and compare them with those of England, Germany, and France. For such a task he is in every way qualified. He is a man of keen observation and rare intelligence, whose judgment is singularly free from the warping prejudice against western civilization which characterizes the mass of his countrymen. He is at once the profound scholar and the practical man of the world; and he is ripe in the possession of an accumulated wisdom and experience which he has gained in half a century of military, political, and administrative service of his country.

It must be said in passing that the great Chinese statesman is one of the most striking and picturesque personalities to be found in the wide world to-day, and easily takes rank with those two aged statesmen in Europe, Bismarck and Gladstone. So strongly, indeed, has his formative and masterful influence been impressed upon his country that he has frequently been called the "Bismarck" of China—than which, we think, no more just and noble compliment could be paid to him.

Li Hung Chang, moreover, comes among us as the author and chief—we had almost said solitary—representative in high places of the party of reform and progress. For nigh upon twoscore years he has striven, amid discouragements which would have brought dismay to a less courageous heart, to introduce the best features of western civilization into China. He has been met at every turn either with open or secret opposition, or what was even worse—indifference and apathy. To him is due the credit for such progress as China has made in the modern industrial arts; it was his hand that was mainly instrumental in unlocking the gates of China for the inflow of international commerce, and incidentally of western ideas and sentiment. The recent disastrous war with Japan, a conflict which he had foreseen and warded off for many years, came at length, and indorsed the policy of the great statesman in tones of thunder. In the extremity of its humiliation his ungrateful country turned to him as its last hope, and sent him to the victorious enemy, with full power to treat for peace according to his own judgment.

The war with Japan was the best thing that could have happened for the party of progress in China. The logic of hard facts has brought home to the government, if not to the people, the urgent necessity for following the example of Japan, and adopting the best features of western civilization; and undoubtedly the extraordinary tour of Li Hung Chang among the western nations has been undertaken largely for the purpose of comparing their methods of manufacture and commerce, before entering upon the industrial development of China upon a large scale. This development is certain to come; and Li Hung Chang has positively stated in England that he will devote the remainder of his life to the especial work of extending the transportation facilities of China both by sea and land. If the Viceroy is successful, this means that an extensive system of railroads will be built—for China is practically without any railroads to-day—and a fleet of ocean and river steamships will be constructed, not to mention the considerable additions which must be made to the navy to bring it up even to the strength that it possessed before the war.

The question naturally arises—and it is being asked by every manufacturing country through which the Viceroy has passed—who is to lay out these railroads, erect these bridges across the great rivers of China, and provide the millions of tons of steel rail, and the vast equipment of locomotives and cars which will be required? In what yards are the keels of the new merchant and naval ships to be laid down?

There are many and cogent reasons why this work, and particularly the former part of it, should fall to the lot of American engineers and manufacturers. Geographically ours is the natural market to which the Chinese should come. We are separated from them by only one half the distance which intervenes between China and the European manufacturers, and by our policy of non-intervention in their national affairs we have won their confidence to a marked degree; as was recently shown in their hour of defeat by the Japanese, when they voluntarily sought the services of an American in preference to any other minister, in negotiating the terms of peace.

But most weighty reason of all for the adoption of the American in preference to the European style of railroads is found in the fact that our methods of railroad building are well adapted to the rapid construction of a large system. In locating and constructing a system of railroads we can defy competition, both in cost and speed; and in every open competition for the erection of railroad bridges our firms have been able to underbid the English, German and French builders, with a large margin to spare.

The question is just now a most important one to this nation. A period of stagnation has followed upon the remarkable activity of the past decade. The capacity of our industrial establishments is larger, in many cases much larger, than the country's demands, and it is necessary for us to look abroad for new markets. The most immediate and promising field certainly lies in China. It will be greatly to our interest to cultivate her good will, and the outspoken words of Li Hung Chang to the representatives of the New York press on the question of the Geary law and the restriction of Chinese immigration prove that there is at least one direction in which we might show our friendly disposition to immediate and good effect.

We think that this country, and for that matter the European nations also, have failed to realize how mighty a factor in the industrial and commercial world China will become, so soon as Li Hung Chang, or, if not he, the party of progress which he has formed, shall have brought its 400,000,000 of people into close touch with the outside world, and taught them to value and call for the conveniences of western civilization—the railroad, the steamship, the electric light, and the thousand and one mechanical conveniences in the design and manufacture of which we are pre-eminent.

### The Big Boats on the Lakes.

Another steel steamship 400 feet long has passed a successful trial off the Chicago lake front, adding, says the Chicago Record, to the very considerable number of these modern vessels, which have marked such progress in the conduct of lake traffic. Twenty-five years ago a lake vessel's captain, could he have sighted one of these monsters off the starboard bow of his little sailing craft, would have believed that a mirage affected his vision; to-day these great vessels slip in and out of ports of the great lakes, scarcely exciting comment.

To the average landsman the comparative size of these vessels when ranged by the side of a big Atlantic liner is not comprehended. For example, the Maricopa, which cruised the Chicago lake front recently, is 426 feet long, 48 feet beam, and 28 feet moulded depth; the American liner St. Louis, one of the large Atlantic liners, is 554⅛ feet long, 62¾ feet beam, with an extreme depth of 42⅓ feet. In these measurements the great comparative depth of the ocean vessel is most prominent. Almost within the present decade these great lake vessels have been designed and built. They are the result of a demand for additional safety to shipping, for cheaper lake freight, and for a more extended volume of lake business. Along with this shipbuilding the work of deepening and improving the straits connecting these bodies of water has gone on. This work, more than any other agency, will tend to place the maximum limit of carrying capacity upon the lake steamer. In general, with an increased capacity for freight, there has been a decrease in the cost of transporting commodities. With improved loading and unloading methods there are still greater possibilities of cheapening transportation, and with every move in this direction of cheapness the necessity will be more and more forced upon the government to provide greater depth in the straits. In this way it seems that traffic on the great lakes is yet in its infancy.

### On the Casting of Steel.

At the Obouchoff Steel Works, St. Petersburg, great inconvenience was felt for a long time in casting large round ingots of five tons and upward for forging guns. The stream of steel falling from a considerable height into the mould from the 30 ton ladles of the Siemens-Martin furnaces gives rise to a considerable quantity of splashes, which in return produce cracks on the surface of the ingots. The same annoyance was also observed in casting rectangular ingots of 25 to 30 tons for armor. M. Posnikoff, the manager of the steel department of the above named works, has devised a very simple method, preventing the steel from splashing. It may perhaps be already in use elsewhere, but anyhow it deserves mention. A tube is prepared of thin sheet iron, such as is used for roofing. The tube is 24 inches in inside diameter, and is suspended from an iron ring, to which there are riveted three bars on the surface of the mould just before casting. The steel is poured from the bottom of the ladle into the middle of the iron tube. All the splashes are thrown on the walls of the tube, which gradually melts away during the rise of the surface of the liquid steel in the mould. We had the pleasure, says Helios, of seeing this device in perfectly successful action at the Obouchoff Works, where it is now in constant use.

### A Cabot Celebration.

A St. John's, Newfoundland, dispatch says that the idea of a Cabot celebration in the colony next year is taking definite shape. The British man-of-war Buzzard goes north to make a survey of Bonavista Harbor, with a view of reporting on the best site for a pier and a monument to Cabot. The celebration proper, it is expected, will take place in July or August next. A public meeting for the purpose of starting the affair will be held about the middle of September.

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## NOTES ON THE AMERICAN ASSOCIATION MEETING, BUFFALO, N. Y.

BY HORACE C. HOVEY.

Some changes have been recently made, and others have been suggested, as to the management of the Association for the Advancement of Science. There has been for some time a generous rivalry between the affiliated societies and the corresponding "sections" of the American Association for the Advancement of Science, which is now settled by an understanding that their work may be amicably combined hereafter. A number of constitutional changes were referred to a special committee that is to report next year. The plan tried this year will be continued, of requiring abstracts of sectional papers to be sent in at least a month in advance, to allow the issuing of a preliminary programme. These papers, moreover, will henceforth be published only by title in the volume of annual proceedings, merely the presidential and vice-presidential addresses appearing in full. An important and desirable change will be that these valuable and carefully prepared addresses, instead of being crowded into the first day of the meeting, will be given on the evenings during the week, in lieu of what have been styled the "complimentary lectures." After a spirited discussion it was decided by a strong majority to hold the next regular meeting at Detroit, August 9, thus giving time for a full week, as required by the constitution, before the date fixed for the British Association to meet at Toronto. Resolutions were passed in favor of the early adoption of the metric system of weights and measures by an act of Congress, to take effect by the first of January, 1898. Action was also taken favorable to vivisection in the interests of science. A committee of five was appointed to attend the International Scientific Congress to be held next summer at St. Petersburg, Russia; namely: Professors Cope, Hall, Emerson, Rice and Wallcott. It was agreed that the fiftieth anniversary of the American Association for the Advancement of Science should be marked by a jubilee meeting, to be held in 1898 in the city of Boston.

The attendance this year was less than formerly, the whole number being 333, of whom 112 were new members. The number made fellows was 82, with one made a fellow for life and one an honorary member. The officers chosen for the next meeting were as follows: President, Wolcott Gibbs, of Newport, R. I. Vice-Presidents: A, Mathematics and Astronomy, W. W. Beman, of Ann Arbor, Mich.; B, Physics, Carl Barus, of Providence, R. I.; C, Chemistry, W. P. Mason, of Troy, N. Y.; D, Mechanical Science and Engineering, John Galbraith, of Toronto, Canada; E, Geology and Geography, I. C. White, of Morgantown, W. Va.; F, Zoology, G. Brown Goode, of Washington, D. C.; G, Botany, George F. Atkinson, of Ithaca, N. Y.; H, Anthropology, W. J. McGee, of Washington, D. C.; I, Social and Economic Science, Richard T. Colburn, of Elizabeth, N. J. Permanent Secretary, F. W. Putnam, of Cambridge, Mass. (office, Salem, Mass.). General Secretary, Asaph Hall, Jr., of Ann Arbor, Mich. Secretary of the Council, D. S. Kellicott, of Columbus, O. Secretaries of the Sections: A, Mathematics and Astronomy, James McMahon, of Ithaca, N. Y.; B, Physics, Frederick Bedell, of Ithaca, N. Y.; C, Chemistry, P. C. Freer, of Ann Arbor, Mich.; D, Mechanical Science and Engineering, John J. Flather, of LaFayette, Ind.; E, Geology and Geography, C. H. Smyth, Jr., of Clinton, N. Y.; F, Zoology, C. C. Nutting, of Iowa City, Ia.; G, Botany, F. C. Newcombe, of Ann Arbor, Mich.; H, Anthropology, Harlan I. Smith, of New York, N. Y. Treasurer, R. S. Woodward, of New York, N. Y.

A decided increase was noted in the number of papers read in the various sections, and many of them were of an exceptionally high character, indicating progress in the main work for which this organization exists, namely, the "advancement of science." Some of the most valuable and important communications were too technical to interest the general reader. This was especially true in the departments of mathematics, astronomy, chemistry and physics. The papers in the section of social and economic science, on the other hand, dealt largely with questions bearing on political and monetary matters, that attracted disproportionately the notice of the local press to the exclusion this year of papers more worthy of remark from a strictly scientific point of view. It is respectfully suggested that the so-called "press secretaries" should each take pains to collate in a readable form the best features of their respective sections, and put them at the disposal of the scientific journals of the country. Instead of attempting to report the work simultaneously done in all the nine sections, we shall content ourselves with detailing what was done in two of them, as specimens of the rest.

THE GEOLOGICAL SECTION.—The opening address by Prof. Emerson has been given by us elsewhere. The following were some of the more noteworthy papers:

Dr. Edmund O. Hovey, of New York, gave a résumé of his microscopical study of an artesian well drilled in 1895 through the coral reefs at Key West, Florida, for 2,000 feet, of which samples were taken at every 25 feet. The surface is an oolite changing to limestone, alternating with beds of sand rock containing masses of porous or compact limestone. The indications show for much of the depth a shallow water or beach formation. Most of the rock is fossiliferous, the lamellibrachs and foraminifera being especially abundant. Minute forms of life predominate. The summit of the Vicksburg beds of the Eocene era was placed at 700 feet below the surface. Miocene and Pliocene were not separated from each other, but their top is 50 feet below the surface. An interesting feature is the frequent recurrence of a minute quantity of fine grained angular quartz sand.

The tuff beds of the Connecticut Valley Trias were described by Prof. B. K. Emerson, showing that great beds of volcanic ashes are associated with sheets of igneous rock, in the Mount Holyoke range, and that the flowing lava became mixed with sedimentary matter. Pitchstone, or volcanic glass, has also been found. The lava flow hardened on top, broke up and rolled over, just as modern lava does, mingling fragments from the top with matter at the base.

There is a famous region in the Dakotas where wells have been sunk into a vast artesian basin. This was described by Prof. J. E. Todd, who stated that the most abundant supply is from the Sioux quartzite, the lowest bed yet tapped. The maximum height to which the water from these wells rises is greatest in the Black Hills, and diminishes toward the east, on the theory that, as the distance from the original source increases, the water leaks from the lower into the higher beds, and thus loses its "head."

Two papers on the geology of California were read by Prof. J. P. Smith, of the Leland Stanford University. He proved the close parallelism with the beds of Europe by the terraces of the Triassic and Jurassic eras. He described the physiography of the region, and discussed the origin and growth of the mountain ranges, illustrating his remarks by aid of the stereopticon. The main orographic movements were in the Cretaceous and Tertiary periods. He explained the Tertiary and Post-tertiary erosion and the uplifts of the Coast Range and the Sierra Nevada. He said that the great valley of California was never an arm of the sea, being full of river deposits. He traced out the ancient river systems, and spoke of recent geologic changes.

The Dalles of the St. Croix, short canyons in Minnesota and Wisconsin, were made the subject of a paper by Mr. Warren Upham. He attributed their erosion to the Aftonion and Wisconsin stages of the glacial period. Previous to the Ice Age a watershed of trappean and Upper Cambrian rocks extended across the present valley. The basin above the Dalles was once drained by a watercourse running to the Mississippi River, between Anoka and Minneapolis, and which was the preglacial St. Croix. Below the Dalles was the Apple River, flowing along where the river now expands into the Lake St. Croix. The channeling of the picturesque Dalles, the central attraction of the proposed interstate park, is attributable to an interglacial river of the Aftonian time, but the gorges have undergone further changes by postglacial stream erosion, and their walls of trap rock have been riven by frost along vertical joint planes.

The evolution of the shark was discussed by Prof. E. W. Claypole, whose observations were based on recent discoveries of fossil remains in the Cleveland shales of Devonian age, whose preservation makes it possible to restore these ancient fish and compare them with existing species. One important fact is that their mouth was at the end of the head, just as in common fishes, instead of being on the under side, as in most modern species of sharks. Other papers on Devonian fishes were read by Dr. C. R. Eastman and Mr. F. K. Mixer, who also exhibited some very fine specimens.

Prof. T. H. McBride exhibited and described some admirably preserved carboniferous plants from Iowa, showing medullary rays, and proving that Sigillaria and Diploxylon are really exogenous trees related to the conifers, though masquerading as ferns. The discovery and demonstration of these intermediate forms of tree life in Carboniferous times is of great importance.

The Cretaceous clay marl bed at Cliffwood, N. J., is the lowest member of the Matawan formation, and it was described by Mr. A. Hollick, who carefully examined its mollusks, crustaceans and leaves as representing the transition from estuary to marine conditions.

The striking features in the topography of West Virginia and Western Pennsylvania were discussed by Dr. J. C. White, who referred the origin of the high terraces of the Monongahela to the glacial lake that was formed by the ice that dammed up the preglacial drainage that was northward into Lake Erie.

Rev. Horace C. Hovey read two papers on the "Making of the Mammoth Cave," and the newly found "Colossal Cavern," of Kentucky, which may be found in full in previous numbers of the SCIENTIFIC AMERICAN.

A new theory in geology was offered by Dr. W. J. McGee, under the title, "Sheetfield Erosion," which aroused much interest and was followed by favorable discussion. He described the peculiarly interesting features of Papagueria, in Arizona and Sonora, a hot and arid area of broad plains, with scattered sierras which rise abruptly. The plains and the mountains alike consist of planed edges of similar strata, thinly veneered with debris. The main agency in this wide planation is storm erosion, active only during a few consecutive hours or days of occasional freshets. Thus the characteristic form of water flow is not in streams, but in sluggishly moving sheets which may be called sheetfloods; these sheetfloods are amply supplied with rock matter, which is mechanically disintegrated rather than chemically reduced, and which is thus an efficient eroding substance; and throughout most of the region the tendency of the storm waters is not to carve valleys, but to plane broad belts two to twenty miles or more in width. It seems certain that this distinctive agency has produced the distinctive conformation and structure of the province.

### Death of Prof. Fowler, the Phrenologist.

Prof. Lorenzo Niles Fowler, a phrenologist who for nearly half a century has been prominent in making the science of phrenology widely known and properly valued, died of paralysis on September 2, in West Orange, N. J., at the home of his sister, Mrs. C. Fowler Wells. He was born June 3, 1811, at Cohocton, N. Y., and was consequently just over 85 years old. He had returned to the United States only a fortnight ago, after having been for thirty-five years in Great Britain, where he was engaged in phrenological work. Among those who had at different times been phrenologically examined by him were the late Nicholas III, Czar of Russia; Dwight L. Moody, Horace Greeley, Harriet Beecher Stowe, Ralph Waldo Emerson, Walt Whitman, Samuel F. B. Morse, Cyrus W. Field, Sir Henry Irving, Dr. Joseph Parker, whose church Prof. Fowler attended in London; John Bright, Richard Cobden, Sir John A. Macdonald, Charles Dickens and William Cullen Bryant.

Prof. Fowler was a farmer's son, and was sent to Amherst College, where he was a classmate with Henry Ward Beecher, with the idea of his becoming a Presbyterian minister, a profession which he relinquished to devote his life to the then comparative new science of phrenology, his brother, Orson S. Fowler, being associated with him. They at first met with considerable opposition, which Prof. Fowler did much to overcome. He was married in 1844 to Dr. Lydia Folger, of Nantucket, Mass., who died in 1879. She was one of the first women in the United States to receive a medical degree, and she, as well as her husband, traveled all over the country lecturing upon phrenology, and making examinations.

Prof. Fowler is survived by one brother, Dr. Edward Fowler, of New York, and two sisters, Mrs. C. Fowler Wells, of West Orange, and Mrs. Dr. Fowler Breakspear, of Birmingham, England.

### Passenger Traffic.

In view of the greater facilities that are being afforded in England to passenger travel, and especially the arrangements made within the last week to run corridor trains to the north, and to give 1,000 mile tickets at reduced rates, it will perhaps interest our readers to know the numbers who travel by railway in Continental Europe. Signor Bodio, in a recent report to the Railway Tariffs Committee in Italy, gave the following detailed figures as to the mileage and number of passengers on the principal railways of Europe:

| Country. | Mileage. | Number of passengers per annum. | Number of passengers per 100 of the popuiation. |
|---|---|---|---|
| Germany | 26,250 | 483,000,000 | 978 |
| France | 23,750 | 305,000,000 | 796 |
| Great Britain and Ireland | 20,625 | 864,000,000 | 2,282 |
| Russia | 18,100 | 33,000,000 | 33 |
| Austria | 9,375 | 85,000,000 | 355 |
| Italy | 8,750 | 51,000,000 | 171 |
| Hungary | 6,850 | 37,000,000 | 214 |
| Belgium | 2,875 | 87,000,000 | 1,426 |
| Switzerland | 2,185 | 37,000,000 | 1,259 |
| Holland | 1,875 | 33,000,000 | 726 |
| Roumania | 1,500 | 5,000,000 | 95 |

With the exception of Russia and Roumania, Italy has fewer railway passengers per head of the population than any of the other countries, and Signor Bodio adds that, while of the available seating accommodation in trains 35 per cent is occupied in France, 28 per cent in Belgium, 27½ per cent in Switzerland, 27 per cent in Hungary, and 25 per cent in Germany, only 23 per cent is occupied in Italy. There are no statistics of this matter for our own country. Better perhaps for the railway companies that it should be so. —Iron and Coal Trades Review.

THE opinion of Nikola Tesla as to the origin and nature of the Roentgen rays, as published in our issue of August 29, was from a more extended paper on the subject which originally appeared in the Electrical Review, and is, we understand, soon to be published in book form.

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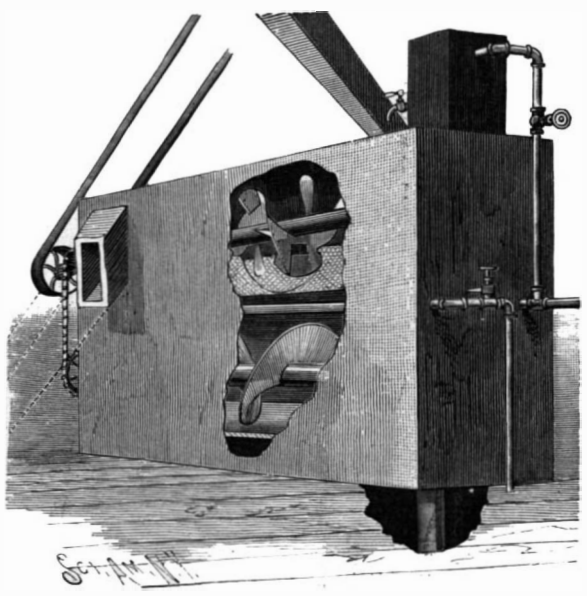
### A NEW SWISS BICYCLE.

We present an engraving of a bicycle which has been invented in Geneva, and which is exhibited at the Swiss National Exposition. It is claimed for this machine that the position which the rider occupies upon it is not only infinitely easier, but that by means of the support for the back, his forces are far more effectively utilized and with considerably less fatigue. His position, as shown by the engraving, is held to be the normal position of a man in a sitting position, and the bicycle is therefore called "La Bicyclette Normale." The inventor, M. Ch. Challand, says in his prospectus: "The principle of the machine is the utilization of the considerable amount of force, very little known, which is afforded by a point of support. Without this point of support, the only force a man has is his own weight. On the other hand, if the back be well supported, he has in each leg a force more than treble his own weight, and which is, in fact, equal to the weight he is capable of carrying combined with that of his own body. The construction of the 'Normal Bicycle' is intended to make use of this considerable amount of wasted force. The point of support is the back of the seat, by means of which the cyclist's body is thrown back and his legs lifted up, owing to the position of the pedals The body is thus placed in a 'normal' posture—hence the name of the machine—he is upright or leaning slightly backward. The 'Normal Bicycle' presents the advantages of greater safety, perfect comfort, healthy position, a greater power over the machine, greater speed, both up hill and on level ground, and less fatigue." It is also claimed for this bicycle that, being much lower than the ordinary so-called "safety" bicycle, it is much easier to mount. We are indebted for the cut which we have reproduced to the official journal of the exposition.

A NEW SWISS BICYCLE.

### A WHEAT MIXER AND TEMPERER.

The illustration represents a machine designed to facilitate the thorough mixing and tempering of grain, using therefor pure water or water of condensation and live steam, a steam coil being also employed to partially dry the grain, as may be desired, or relieve it from excess of moisture. The improvement has been patented by William F. Cromwell and James Schoonover, of Morganfield, Ky. The box body of the machine has a curved bottom, and is divided into an upper and lower compartment by a curved wire screen partition. In the upper compartment or mixing chamber is a cut-



SCHOONOVER AND CROMWELL'S WHEAT MIXER AND TEMPERER.

flight conveyer, on the shaft of which is a flange that is cut, broken, or interrupted at various points to form opposite extending wings, there being also at various points mixing paddles, whereby a maximum of agitating or mixing capacity is obtained. Adjacent to the point where the grain-supplying chute enters the mixing chamber is a tank, from a faucet in which water is permitted to flow upon and mingle with the entering grain, the tank being supplied by water of condensation from a coil supported by suitable hangers below the sieve-like bottom of the mixing chamber, the coil extending the entire length and width of the body of the machine, and having one or more nozzles from which live steam is permitted to escape.

As the conveyer in the upper or mixing chamber conducts the grain to the discharge chute at the opposite end, the lower conveyer carries the material passing through the sieve in a contrary direction, to a discharge outlet in the bottom of the machine. The grain in its passage, after having been wet with the water of condensation, is subjected to the action of live steam from the nozzles and is affected by the heat from the coils, each and every grain of wheat being thus tempered to the same extent, while the bran may be toughened without injuring the germ, the flouring qualities, or the granulations of the grains of wheat. The wire cloth forming the bottom of the mixing chamber may be of different meshes and of different sizes of wire to afford the most effective cleaning surface and permit foreign substances to fall through, and the wheat is not fully dried before it is ground, but is carried directly to the rolls from the machine in a tough and damp condition, to be ground at once. It is apparent that in the working of the machine, the degree of heat and moisture may be regulated to get the best results for different qualities of grain.

### Weather Proverbs.

Sure signs of approaching atmospheric changes, says the Boston Transcript:

If at sunrise there are many dark clouds seen in the west and remain there, rain will fall on that day.

If the sun draws water in the morning, it will rain before night.

When the sun rises with dim, murky clouds, with black beams and clouds in the west, expect rain.

If the sun rises pale, there will be rain during the day.

"A red morn; that ever yet betokened
Wreck to the seamen, tempest to the field,
Sorrow to shepherds, woe unto the birds,
Gust and foul flaws to herdsmen and to herds."
—Shakespeare.

If the sun rises clear, then shadowed by a cloud, and comes out again clear, it will rain before night.

"In fiery red the sun doth rise,
Then wades through clouds to mount the skies."

Red skies in the evening precede fine morrows.

A red sun indicates fair weather.

A red evening indicates fair weather, but if the red extends far upward, especially in the morning, it indicates wind or rain.

A very red sky in the east at sunset indicates stormy winds.

If the sun sets in dark, heavy clouds, expect rain the next day.

A bright yellow sunset indicates wind; a pale yellow, wet.

If the sun sets pale, it will rain to-morrow.

"The weary sun hath made a golden set,
And by the bright track of his fiery car
Gives token of a goodly day to-morrow."
—Shakespeare.

A halo around the sun indicates the approach of a storm, within three days, from the side which is more brilliant.

If there be a ring or halo around the sun in bad weather, expect fine weather soon.

Haze and western sky purple indicate fair weather.

A blur of haziness about the sun indicates a storm.

If the sun burn more than usual, or there be a halo around the sun in fine weather, expect rain.

When the sun in the morning is breaking through the clouds and scorching, a thunder storm follows in the afternoon.

"Sunshining shower won't last half an hour;
Sunshine and shower, rain again to-morrow."

Pale yellow twilight, extending high up, indicates threatening weather.

"As the days begin to shorten,
The heat begins to scorch them."

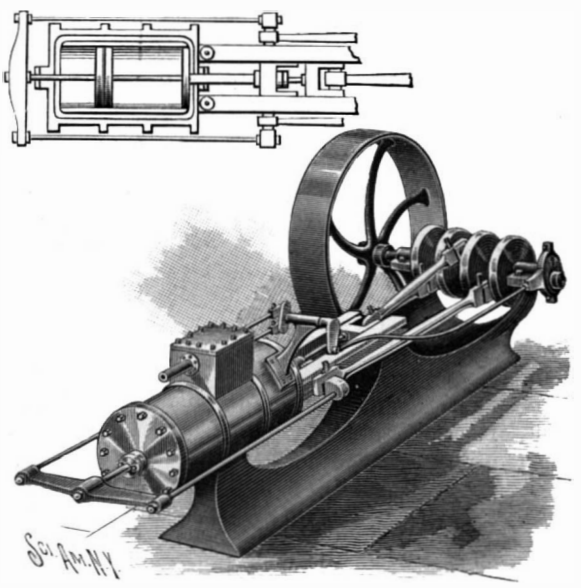
Sun dogs in summer indicate a storm.

### New Use for Old Horse Cars.

A novel but very sensible use is made of old horse cars in Connecticut. When the trolley system was introduced in the various cities in that State, says the Electric World, the problem as to what should be done with the old horse cars remained unsolved until some enterprising genius suggested using them for summer cottages, hunters' camps, lodges, etc. The public readily fell in with the idea, with the result that all of 600 old cars that went into disuse are now being utilized for these novel purposes. It is stated that along the coast of Long Island Sound, from Watch Hill to Larchmont, these cars may be seen perched up on top of some breezy bluff on the sandy shore, or in some quiet, shaded nook, affording temporary habitation for families, fishermen, hunters, etc. The demand for old horse cars has greatly increased in consequence of this new use. One woman recently asked the station agent at New London for his lowest prices for passenger cars, also a list of the various styles. A Norwich party has arranged four cars in the form of a hollow square and erected a canvas awning in the square. One of the cars is used as the kitchen and the others as sleeping rooms, dining room, parlor, etc. One gentleman has five cars on Block Island, which he has placed end to end like a train. The supply of old cars in this one State has thus suddenly become exhausted.

### A NOVEL STEAM ENGINE.

An engine in which the steam acts on two pistons in the same cylinder at one time, so that the steam is utilized expansively and to the fullest advantage, is shown in the accompanying illustration, and has been patented by William A. Jordan, of Mulvane, Kansas. The cylinder is connected at its open ends with a steam chest, with which it is also connected by ports at points approximately one-third the length of the cylinder from its ends. A slide valve, reciprocated from the main driving shaft, operates over the live steam ports and the exhaust port, and a sliding seat is provided for this valve. As may be seen in the small sectional view, the cylinder has three pistons, the outer one of which is on a piston rod extending through the outer head of the cylinder to a transverse beam connected by rods with a crosshead connected by pitmen with crank arms on the main driving shaft. The middle piston of the engine is on a piston rod which passes through the other end piston and its hollow piston rod to connect with another



JORDAN'S STEAM ENGINE.

crosshead connected by a pitman with a crank on the main driving shaft. The hollow rod of the inner end piston is connected with the first crosshead, so that the inner and outer pistons move simultaneously in the same direction, and in opposite directions to the movement of the middle piston, the cranks on the main driving shaft being diametrically opposite each other. As the open ends of the cylinder are connected with the interior of the steam chest, there is no vacuum formed in these ends on the inward movement of the outer pistons, and the steam jacket surrounding the cylinder holds up the temperature of the cylinder walls to prevent undue condensation of the steam which is being expanded, giving a higher average pressure. The cut-off may be regulated as desired by the sliding valve seat.

ELEPHANTS in Africa are becoming so scarce that it is proposed to establish protected reservations for them on territory under British protection, like Somaliland.

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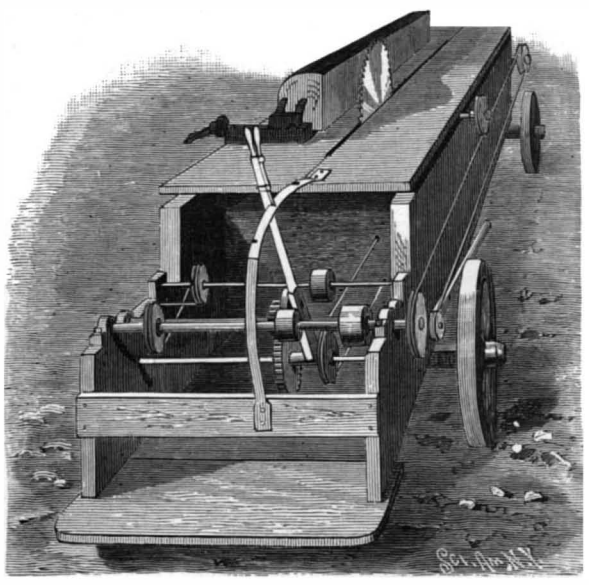
### A PORTABLE SAWMILL.

The illustration represents a sawmill in the form of a wagon, which may be conveniently moved from place to place for sawing logs into lumber, railway ties, etc., near where the trees are felled. The improvement has been patented by H. A. Sager, 64 East Park Street, Butte, Montana. The sawmill bed has longitudinal guideways in which a carriage moves forward and backward, the saw arbor being journaled in the carriage,

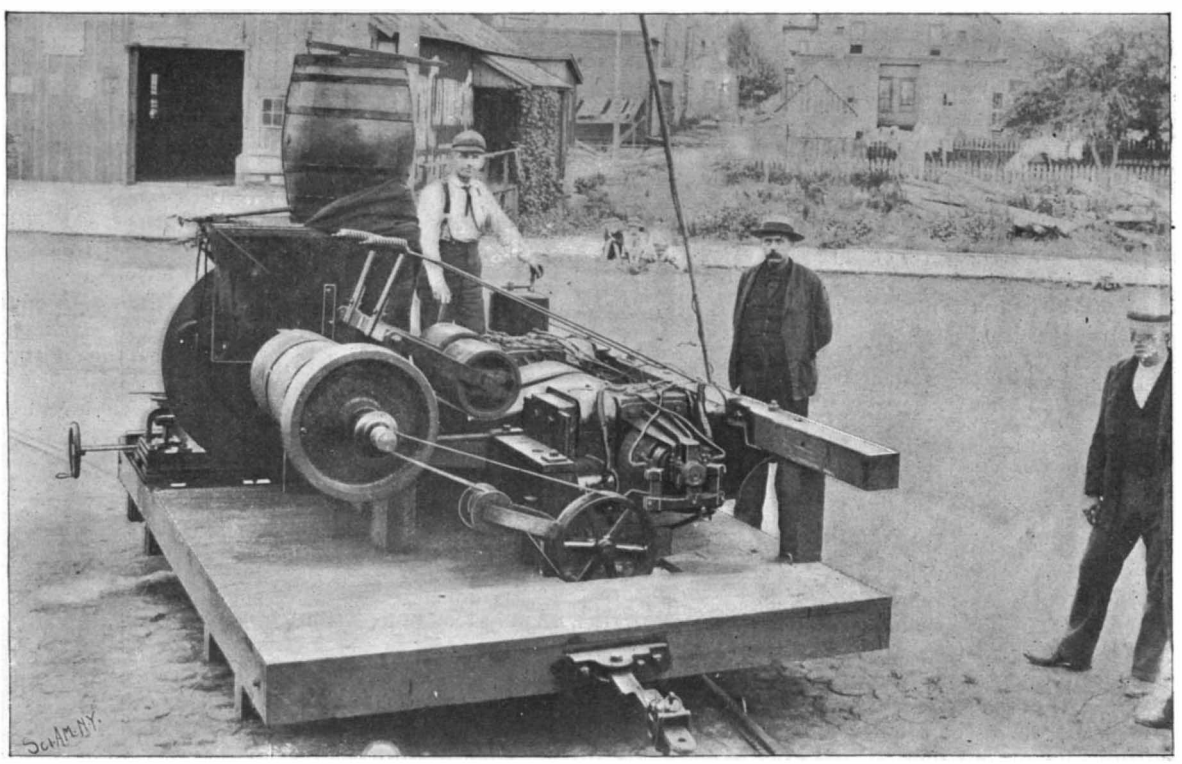


SAGER'S PORTABLE SAWMILL.

and the circular saw extending up through a slot in the table forming part of the bed. The saw is rotated and a forward and backward motion given to the carriage from a main driving shaft, connected with a source of power, and located at the rear of the wagon body. On one end of this shaft is a grooved pulley, over which passes a rope belt extending along one side of the bed and over a second grooved pulley at its forward end, one of the runs of the belt also passing once around a pulley on the outer end of the saw arbor, whereby the saw is rotated. The carriage is moved by a rope belt connected with it and extending over pulleys at the front and rear of the bed, the forward and backward motion being effected through a gearing on the shaft of the rear pulley, the gearing being in mesh with a pinion on a short shaft journaled in a hand lever. The short shaft also has a friction pulley adapted to engage either of two friction pulleys, one of which is on a shaft carrying a cross belt, so that, according to the position of the hand lever, the carriage will be caused to travel either backward or forward. The hand lever is guided on and adapted to be locked to a toothed segment. In order to tighten the saw-driving belt, a tightening pulley is secured on a lever fulcrumed at the side of the wagon.

### PORTABLE ELECTRIC RAIL SAWING MACHINE.

We have been favored by Mr. G. S. Johnson, general manager of the Consolidated Street Railway Company, of Grand Rapids, Mich., with a photograph of an electric saw, which is used to cut off the battered ends of rails so that they can be relaid, thus obviating the purchase of new rails. The car holding the machine is 12 feet in length by 8 feet wide. The car is equipped with two Rae motors of 30 horse power each, the current being obtained from a trolley pole. The motors are belted to the saw shaft, and an idler pulley keeps the belts tight. The saw, which is a smooth steel disk, is 42 inches in diameter, make 1,800 revolutions per minute, and is supplied with water from a barrel by means of small jets. Arrangements are provided for feeding the rail to the saw. In operation this machine has been found to be very efficient and economical, sawing off the end of a 66½ pound girder rail in one minute. The total cost of sawing rails is $1.50 per ton, which includes the handling of the rails.



PORTABLE ELECTRIC RAIL SAWING MACHINE.

THE man who studies a single subject until he loses sight of everything else is always in danger of parting with his judgment. When he does that, when he is entirely wrapped in a single idea, he almost inevitably develops what unspecialized people call crankiness.

### An Expedition to Discover How Coral Islands Grow.

BY E. W. RICHARDSON, IN KNOWLEDGE.

Fifteen years ago Darwin, finding surface investigation and dredging insufficient to determine with certainty the origin and genesis of coral atolls, expressed in a letter to Alexander Agassiz the wish that some rich man would have borings made in some of the Pacific and Indian atolls, and bring home cores from a depth of five hundred or six hundred feet for examination. For nine years this idea lay dormant in the minds of scientific men, but six years ago it took shape, and a committee of leading geologists and biologists was formed by the British Association to carry it out. Prof. Bonney was appointed chairman and Prof. Sollas secretary to this committee. The British Association appealed to the Royal Society, which readily supported the scheme. A large sum was voted from the Government Grant Committee, and another by the Royal Society from its own funds. Prof. Anderson Stuart, of Sydney, N.S.W., has given great help, and it was through his efforts that the Colonial government was induced to lend drill and steam plant to the value of two thousand five hundred pounds. The New South Wales government also supplied skilled workmen, and contributes toward the wages of those in charge of the machinery.

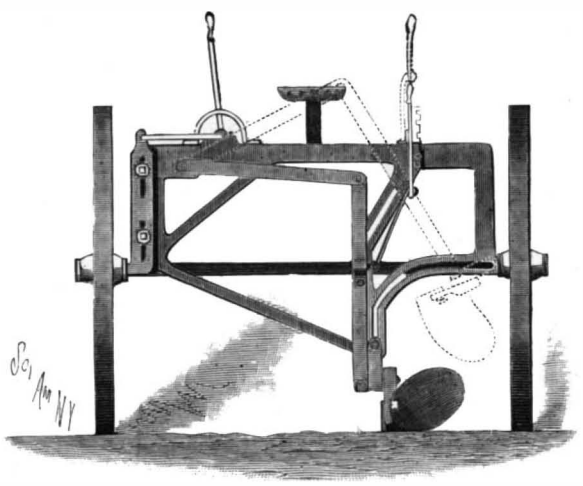
After some five years' preliminary preparation and hard organizing work, an expedition to carry out Darwin's wish, and to discover by boring the origin of a coral atoll, was formed. The expedition is in charge of Prof. Sollas, who is well known as having devoted special attention to coral formations. The other members of the expedition are Mr. John Stanley Gardner, B.A., whose work as a biologist is considered of great promise, and Mr. Charles Hedley, of the Australian Museum, who, besides being a naturalist, is an artist, and will make all the drawings and sketches for the expedition.

The government have placed H.M.S. Penguin at the disposal of the expedition, for the purpose of carrying the personnel and plant from Sydney to the scene of operations and back. The Penguin started on May 1, and next month will probably be bringing the members of the expedition back. The island chosen for investigation is Funafuti, the largest isle of the atoll of that name, which forms one of the group of the Ellice Islands. These coral isles are situated in a latitude 9° south, longitude 180°, and almost due north of Fiji. Funafuti is a typical atoll, being a chain of thirty-five islets encircling a large central lagoon about ten miles long by five wide. The chief island—and that on which the expedition is located—is about four miles long by half a mile wide, and it is nowhere higher than from eight to nine feet above the sea level. The island, which is under British protection, is covered with cocoanut trees, and supports a peaceful population of four hundred natives, nominally Christian.

Prof. Sollas' instructions are simplicity itself; he is "to investigate a coral reef by sounding and boring," and is to do so with a mind quite unbiased as to the various rival theories of coral reef formation. The drill which does the boring is faced with black diamonds, which will cut through anything. The diameter of the drill is four inches. Seeing that the coral polyp has never been recorded as living at a greater depth than ninety feet, it will only be necessary to bore to a depth of six hundred feet, and if that depth be reached, the chief object of the expedition will have been attained. At the same time it is an open secret that Prof. Sollas intends to go as far down as one thousand feet, if possible, and thus solve beyond a doubt the point to be cleared up.

### AN IMPROVED PLOW.

The accompanying illustration represents an improvement whereby, when the plow beam is elevated, it will be turned in a manner to invert the plowshare, as shown in dotted lines, thereby spilling adhering material, the plow being seen looking from the rear. The improvement has been patented by Henry J. Wildhagen, Palatine, Ill. The wheel on one side is made adjustable with the plow frame, and controlled by a



WILDHAGEN'S PLOW.

lever, in order to facilitate work on slanting ground or on a hillside, also permitting one of the wheels to travel in a furrow while the other is on the surface of the ground, the plow making furrows of uniform depth.

There are two angular guideways at the other side of the frame, and the outer one of two pivotally connected links has a pin which moves in the upper one of the two guideways, the end of this link being pivotally connected with one member of an angle arm pivoted on the inner side of the plow beam, the other member of this arm having a guide pin which travels in the lower guideway. A rod pivotally connected with the pin moving in the upper guideway is attached to a shifting lever fulcrumed on the upper portion of the frame, this lever having a locking device engaging a rack, and when the lever is carried to an upper position, as shown in dotted lines, the plow beam is gradually raised and turned until its land side is in an upper and its mouldboard in a lower position. By this turning of the plowshare when the beam is raised the share is kept clean, and the plow may be taken from one place to another without the plowshare touching the ground.

### The Utility of Inventions.

It is, no doubt, true that when a new invention is introduced which revolutionizes some particular art or branch of business, it at first decreases the number of persons employed in that particular line; but that is only temporary, for in a short time the result is a cheapening of the product, a greatly increased demand for it, because of this cheapening, and then necessarily an increased demand for laborers in that line, and almost universally at increased wages. The statistics show this to be true beyond the possibility of a question. The records of the labor bureau of the United States show that from 1860 to 1880, the most prolific period of inventions, and the most intensified in all directions of their introduction, the population increased 59·51 per cent, while in the same period the number of persons employed in all occupations—manufacturing, agriculture, domestic service and everything—increased 109·87 per cent; and in the decade from 1870 to 1880 the population increased 30·08 per cent, while the number of persons employed increased 30 per cent. As shown by the investigation of a committee of the United States Senate, wages have increased 61 per cent in the United States since 1860. And, as we all know, during that same period the cost to the people of nearly all manufactured articles has been decreased in as great if not a greater ratio.—Canadian Journal of Fabrics.

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## THE NEW EAST RIVER BRIDGE.

(Continued from first page.)

the rapidity with which the terminal stations can load up and dispatch the trains.

The Bridge Commission has been guided in the location and design of the new structure by the above mentioned facts, as will be seen by reference to the accompanying bird's eye view of the two bridges and the surrounding districts. It will span the East River at a point a mile and a half to the north of the present bridge. The terminus of the New York approach being located on the northern half of the block lying between Delancey and Broome, Clinton and Attorney Streets, will be within easy reach of the Second and Third Avenue elevated roads, and it will be centrally situated with regard to the cross-town car lines, which connect with the North River ferries, and transfer with the various surface roads running north and south on Manhattan Island.

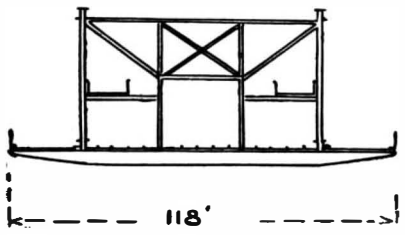
The terminus of the Brooklyn approach is at present on the block between South Fourth and South Fifth, Driggs and Roebling Streets, though it is to be hoped that permission will ultimately be granted to place it on the adjoining block to the south, which would enable the bridge and approaches to be run in a continuous straight line from one end to the other, and would do away with the present unsightly curve and avoid the inconvenience which it would cause in subsequent operation. This change would also place the Brooklyn approach in close touch with Broadway, which has been chosen as the most central thoroughfare in Brooklyn north of the present bridge. It is as important a terminal point for elevated and surface roads in North and East Brooklyn as Fulton Street, the terminus of the Brooklyn Bridge, is for Brooklyn in general and South Brooklyn in particular. The carrying capacity of the bridge will be very large. There will be two elevated railroad tracks, four tracks for surface cars, two eighteen foot roadways and two footwalks twelve feet wide. The elevated tracks will connect the Brooklyn and New York elevated systems, and will enable an unbroken journey to be made from any of the elevated lines of New York across the river to Brooklyn, and a similar convenience will be afforded to passengers on the surface roads.

The new structure will be a steel wire suspension bridge, and larger in every way than the Brooklyn Bridge. When it is completed it will take rank as the most notable single span in the world, its six lines of railroad track, its two roadways and two footwalks more than outweighing the extra one hundred and ten feet of length in the single spans of the Forth Bridge in Scotland, which carry two railroad tracks only.

The foundations for the piers will be four in number, two under each tower. They will be sunk by means of caissons and the pneumatic process to a bearing upon the solid gneiss rock, which, on the New York side, is found at a depth of about 65 feet, and on the Brooklyn side at 86 and 100 feet, below mean high water. The caissons will be filled with concrete, and upon them piers of solid masonry will be built up to 23 feet above high water. Four massive steel footings will be placed upon each pier, upon which will rest the eight legs of the steel towers. The legs, four feet square, will be built up of plates and angles, and will be tied together with a strong system of bracing. The distance between centers of piers will be about 97 feet, and the two halves of the tower will rise vertically as far as the level of the bridge floor, when they will be battered slightly inward. The top of the towers will be 335 feet above the river.

The floor of the bridge will be carried upon four steel cables 18 inches in diameter. The diameter of the Brooklyn Bridge cables is 15 inches. The increased size, and the superior quality of the steel wire in the new cables, will enable them to carry more than double the load of the Brooklyn Bridge cables. As at present estimated each cable will contain about 6,800 wires, each $\frac{3}{16}$ inch diameter. This will give a total of 27,200 wires in the four cables, and their united strength will amount to 68,000 tons, reckoning 5,000 pounds to the wire. The weight of the four cables per foot of the bridge will be 3,000 pounds. The length of the bridge from tower to tower will be 1,600 feet, and the cables, after passing over the movable saddles at the top of the towers, will be carried down and secured within massive masonry anchorages, which will be placed 570 feet inshore from the towers. The anchorages, which will be about 150 feet square and 100 feet high, will counteract the pull of the cables, and their united weight will be over 160,000 tons, or about thirteen times the weight of the main span, which will amount to some 12,500 tons. The bridge is designed to carry a maximum live load of 8,000 pounds per linear foot, the total combined dead and live load for the whole main span being 18,900 tons. A unit of stress is used which gives a margin of three on the cables, and of from five to six on the floor system.

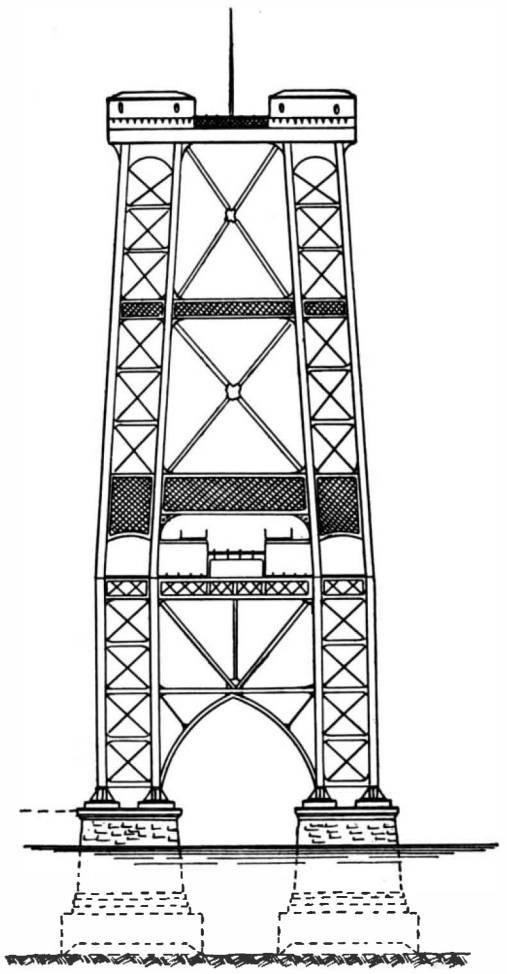
It will be seen from the illustrations that the bridge proper ends at the towers, the floor of that portion of the bridge between the anchorage and the towers being carried, not as in the Brooklyn Bridge, upon the main cables, but upon two independent deck spans supported by the towers, the anchorages, and an intermediate pier. Perhaps the most striking feature of the main span is the pair of massive stiffening trusses, 45 feet high (those on the Brooklyn Bridge are 17 feet high), which run continuously from tower to tower, to which they have a pin connection. These trusses have a special interest from the fact that they are of triple intersection, and that they will have riveted instead of pin connections throughout. This design is in keeping with a reaction which is noticeable among bridge engineers in favor of riveted construction for certain classes of work. It has been found that, for spans up to 175 and 200 feet, the ease with which a pin-connected structure can be erected is more than compensated by the rigidity of the riveted type, and the action of a shallow




CROSS SECTION AT CENTER OF SPAN, EAST RIVER BRIDGE.

stiffening truss of a suspension bridge under load brings it, despite its great length, under the category of short spans. Riveted railroad bridges have lately been built with spans as long as 234 feet, and are giving excellent results. The members of the web system of the trusses will consist generally of 3½ and 4 inch by 6 inch angles, and the chords will be built of plates and angles, and will be 30 inches wide by 36 inches deep.

There will be plate steel floor beams at each panel point, spaced 20 feet apart. In order to gain head room above high water these will be made shallow, being only 5 feet deep for a length of 118 feet; and to resist the heavy bending strains of the live load they will be reinforced by a supplementary overhead truss, to which they will be suspended at two intermediate points. The plate stringers, 2 feet deep, will be riveted to the floor beams, and will extend beneath the rails and roadways. The trusses will be placed 72 feet apart and on the outside of the car tracks, the roadways being carried upon extensions of the floor beams, outside the trusses. Between the trusses will be the six trolley and



FRONT ELEVATION OF TOWER, EAST RIVER BRIDGE.

elevated tracks, the two latter being in the center. Above the trolley tracks and against the trusses will be the footwalks.

The work of providing against wind pressure is largely assisted by the great width of the bridge, 118 feet. It will be effected by "cradling" the cables, i. e., drawing each pair together so that they will lie within the vertical plane drawn between their points of support on the towers; and also by a double system of lateral bracing, one on the top and one on the bottom chord. That on the bottom chord will be riveted to the floor beams and to the chords, and the combined effect of cables and bracing will produce an exceedingly rigid structure. The viaduct at each end of the bridge will consist of plate girder spans carried upon braced towers. It is the object of the commissioners to erect a bridge which shall form a great thoroughfare for an uninterrupted stream of traffic between the two cities and their outlying districts, and thereby avoid the terminal delays which limit the capacity of the Brooklyn Bridge. To this end terminals and toll houses, or anything which might tend even temporarily to check the flow of traffic, will be reduced to the lowest practicable limit. The idea is an excellent one, and a study of our front page illustration, which is self-explanatory, will show how admirably the location has been chosen for this purpose.

This great undertaking is under the control of a joint commission of the cities of New York and Brooklyn, and its execution is now fairly under way. If the funds for construction are forthcoming as fast as the engineers can use them, the opening of the bridge should be contemporaneous with the opening of the twentieth century; and it is likely that the consolidation of the two cities will make such a speedy completion of the work entirely possible.

Our thanks are due to Mr. L. L. Buck, M. Am. Soc. C. E., who has kindly placed details and plans at our disposal.

### Science Notes.

Canada proposes to erect a suitable monument to John and Sebastian Cabot at Bristol, England, to commemorate the voyage which these navigators took in 1497, which ended in the discovery of the Canadian coast.

Mr. Hiram Maxim, in a recent letter to the London Times, thinks that Prof. Langley was more sensible in making a small machine and projecting it from a boat, so that it would not be smashed when it fell into the water, than he himself was in building one twelve times as large and starting it from rails on the ground. Every fall would involve three months' time and $5,000 for repairs.

The following is vouched for by the Electrical World, which says that it is referred to by a German contemporary: This little device is called "Automatischespiegelglassplattenblitzschutzvorrichtung." As its name clearly indicates, it is an apparatusforprotectingagainstlightningconsistingof platesof mirrorglass actingautomatically. In this country we are in the habit of calling this simple device a "cutout."

Foreign books are admitted free of duty in all cases into 69 countries out of 110 whose laws have been investigated by M. Le Soudier. In 13 others unbound books are free, but there is a duty on the binding. In 28 countries books pay duty, though in eight of them exceptions are made in favor of books intended for teaching. In most cases the duties are very slight, hardly interfering with importations. In China the customs duties on the books imported by missionaries is a cent or two a pound on the weight.

Aconcagua, the highest peak on the Western Hemisphere, is to be attempted again this fall by Mr. E. A. Fitzgerald, who explored the New Zealand Alps. If he succeeds in getting to the top, which is 23,200 feet above sea level, he will beat the highest mountain climbing record, Sir W. M. Conway's 22,600 feet ascent of Pioneer Peak in the Himalayas. Dr. Gussfeldt has tried Aconcagua, but got into trouble with his guides and had to turn back 2,000 feet from the summit. Mr. Fitzgerald will have in his party the Swiss guide Zurbriggen, who accompanied him in New Zealand and was with Conway in the Himalayas.

A girl who can see the Roentgen rays has been found by Dr. Brandes, of Halle, who discovered her. Starting from the fact that the rays do not penetrate lenses, he hunted for some one the lens of whose eyes had been removed, an operation performed not rarely for extreme short-sightedness or for cataract. The girl, who had had the lens of her left eye removed, was able to see the light with it, though her right eye, which retained its lens, could see nothing. Dr. Brandes asserts that the rays affect the retina of the eye, and if any one's head is inclosed in an opaque vessel near the source of the rays, the light can be seen even with closed eyes.

The following passage, from a speech by Lord Kelvin, is worth recording in the most imperishable letters: "One word characterizes the most strenuous of the efforts for the advancement of science that I have made perseveringly during fifty-five years: that word is failure. I know no more of electric and magnetic force, nor of the relation between ether, electricity, and ponderable matter, nor of chemical affinity, than I knew and tried to teach my students of natural philosophy fifty years ago in my first session as professor. Something of sadness must come of failure; but in the pursuit of science inborn necessity to make the effort brings with it much of the certaminis gaudia, and saves the naturalist from being wholly miserable, perhaps even allows him to be fairly happy, in his daily work. And what splendid compensations for philosophical failures we have had in the admirable discoveries by observation and experiment on the properties of matter, and in the exquisitely beneficent applications of science to the use of mankind with which these fifty years have so abounded."

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## Correspondence

### Photograph Enlarging Apparatus.

To the Editor of the SCIENTIFIC AMERICAN:

We notice with pleasure that you give a description of our photograph enlarging apparatus on page 142 of your issue of August 8, but see that you attribute the design to M. J. Carpenter. Will you permit us to make the following slight correction? The apparatus was invented by our M. Gaumont, and it has always been constructed by the Comptoir Général de Photographie. With many thanks and assurances of our highest consideration, L. GAUMONT & COMPANY.

Paris, August 17, 1896.

### Stone Carving: Where Should It be Done?

To the Editor of the SCIENTIFIC AMERICAN:

The writer who, under the heading of "Carving Before and After Placed" (an article which has been copied into some of our London technical papers), says he does not really believe a stone carver knows why he prefers to carve his work in situ, knows very little of the topic upon which he writes.

It is impossible to carve stone upon the banker (without the carvings be a succession of repliche, of the effect of which a model one has already been carved in place) and be sure of the success, or non-success, of the work. It is not how carving looks under the nose of the artist, but what its finished effect is from the ground—from the point of view of the ordinary spectator. This is a most necessary element to its ultimate artistic effect.

All the best works in this country have been carved in block and in place, and so far as my experience goes in the United States (and it has been somewhat extended), all the most successful exterior facades have had their carved work executed in place also. In France they go a step farther, and a greater part of the moulded work—the actual masonry—is also done in place. This is what an English mason can seldom or ever do. He can work the most delicate and intricate mouldings, when leaning over them by the banker's side, but if he is required to stand upright, as a stone carver does, and do his work in that position, he is as uncomfortable personally as his work is generally deplorably disappointing.

To a practical man of artistic intent, there can be no two ideas about which is right or wrong as regards the position in which stone carving should be done. If executed upon the scaffold, then, if the craftsman has natural ability, he will leave it a success, and not before. If, however, it is done upon the banker and afterward fixed, no matter how skillful the workman may be, it is a pure chance whether the effect, after the stone has been put up, is satisfactory or not.

When the writer to whose doctrine I take exception says, "for the most part the ornamental work (i. e. stone carving) could, it would seem, be done to better advantage in the yard, or under cover, than when the workman is slung upon a staging," it is clear he has little practical knowledge of his subject. Of course, if a handicraftsman was simply "slung up," he would have little chance of working in comfort, and the man who does not work in comfort cannot produce good work. A stone carver, in this country at least, always works upon a staging four boards wide, which is the minimum width required for the operator to step back and see the passing effect of his labors as they progress. This scaffolding should be some five feet below the work to be carved. A good gage for scaffolders is to put their boards so that, in a capital or spandrel of ordinary size, for instance, the nose of the actual workman will be level with the middle of the block to be manipulated.

The more than hinted danger in lifting carved stones up to their places is nothing at all. With ordinary mechanical care, anything can safely be hoisted.

The question why stone carvers prefer to do their work in place is a distinctly artistic one. It can, I insist, in the best interests of their art, be better done there than it can upon the ground; hence natural instincts teach them that is the place whereon their calling may be carried out to the best advantage.

HARRY HEMS.

Exeter, England, August 15, 1896.

### "Barisal Guns"—Reminiscences of the Charleston Earthquake of August 31, 1886.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of SCIENTIFIC AMERICAN of June 27, 1896, in an article headed "Barisal Guns," after an interesting account of these strange acoustic phenomena, you ask of any of your readers who know personally or otherwise of these curious noises that you would like to get from them an account of it.

I have personally heard these noises (evidently subterranean detonations) many times in the Blue Ridge Mountains of this State and North Carolina, but never so forcibly or distinct as I (and many others) heard them in this region for many days previous to the earthquake of August 31, 1886, the center of which was probably not more than seven or eight miles from here (Summerville, S. C.), more generally known as the Charleston earthquake of August 31, 1886. Having been a resident here (Summerville, S. C.) at the time of this earthquake, I recollect that for several days previous to the main shock (August 31, 1886), the sky being perfectly clear, rather coppery in hue, a profound calm prevailing, with an oppressive heat, there began to be heard about six or seven days before the shock of August 31, 1886, at irregular intervals (alternating with occasional low rumblings, as of wagons rolling over bridges), a deep, booming sound, like the discharge of siege guns in the far distance. For nearly a week these sounds could be distinctly heard all throughout this entire region, for at least a radius of twenty miles around Summerville, S. C.

This weird sound seemed, at Summerville, to come from out of the distant southeast, and as from depths beneath the ocean. The tone of the sound, though heavily masked from depth and distance, was deep and profound, massive in volume and power, and was most significant and impressive of the play of vast energies, especially as heard in the silence of our surrounding forests. Along with some of the more distinct detonations, tremors of minor earthquake shocks could be felt precursory of the main shock of August 31, 1886. There were other strange acoustic phenomena. They could also be heard for many days prior to August 31, and in the intervals of the heavy booming (of phantom cannon?) peculiar and startling sounds (somewhat masked), resembling the rushing of railroad trains upon distant bridges. This frightful prologue of "Barisal Guns," in conflict in the lower depths, combined to impress on the mind a sense of mighty energies in conflict, rending the foundations of the earth. This sound of deadly struggle was most distinctly subterranean, but always masked, as coming from great depths below.

And there was yet another peculiar sound, heard both before and after the main shock, usually occurring at the moments of minor shock and tremor, which seemed to resemble the rush of a great (subterranean) wind, or rather as of the passage of a whirlwind or aerial vortex, sweeping through the earth below. Its resemblance to the peculiar rush of wind was most striking, as was also its no less marked subterranean character. All these strange occurrences took place in a period of profound calm—not a leaf moving nor a breath of air stirring. These events were subterraneous, not aerial.

The acoustic phenomena preceding, accompanying, and following this earthquake were most striking. The sound of the "Barisal Guns" kept up at intervals for some time after the main shock, but with diminishing intensity, and finally disappeared in about a year afterward.

Another acoustic phenomenon, well worth recording as a phase of this earthquake, was a sound like that of giant blows striking upward from below against the earth crust, as if some Titan were trying to drive a hole through the earth. The thud and jar from these blows were often tremendous, and could be felt over wide spaces. The sound created an impression of the projection of enormous masses of liquids and solids from below against the earth crust, as if trying to gain a vent. This sound caused a great terror to those under whose demesnes (or farms) it occurred. They thought that the earth would be driven through beneath their very feet. I knew of several who became perfectly frenzied with fear and incontinently fled from their homes (and the country hereabout). While this strange sound was being heard, if one placed a stick in the ground to some depth (which I did several times) and applied his ear to it, he could hear the blended fury of impact, rending, crushing, and tearing asunder; violent jar and tremor, mingling ever and again with the deep tones of the "Barisal Guns."

Dr. T. N. ROBERTS.

Summerville, S. C., July 6, 1896.

### To Make Ordinary Plates Orthochromatic.

Ordinary gelatino-bromide plates can be orthochromatized by immersing them for three minutes in a dipping bath containing a mixture prepared as follows:

A.

| | |
|---|---|
| Erythrosine | 5 gr. |
| Alcohol | 5 oz. |
| Water, to | 20 " |

B.

| | |
|---|---|
| Ammonia | 2 oz. |
| Water, to | 20 " |

For use, take one ounce of each of the stock solutions A and B, and make up to ten ounces with boiled water.

After immersion, the plates must be washed until water runs evenly over their surfaces, and can then be placed away to dry. Quick drying can be effected by soaking the plates for five minutes in a bath of alcohol.

Deep ruby light only should be used for conducting the operations throughout. The treatment is said to increase the general sensitiveness of the plates, as well as conferring orthochromatic properties upon them.—The Amateur Photographer.

### Recent Archæological News.

The tiara of the Scythian King Saitapharnes, which was recently acquired by the Louvre for 200,000 francs, is now regarded with suspicion. A Russian savant, M. Welesowski, has pronounced it bogus.

Kynosarges, a suburb of ancient Athens, with a famous gymnasium, is being hunted for by the British School of Athens to the south of Mount Lycabettos on the banks of the Ilyssus. From the remains found in the preliminary excavations, it seems likely that the true site has been discovered.

The Egyptians were conversant with the art of landscape gardening, though they had to contend with the flatness of the land. Water, however, as an adjunct was often called into play, for there was the inexhaustible Nile. We have three plans of their gardens, as the one found in the tomb of Meryieat Tell el Amaron, which gives us the perfect idea of how a grand garden was laid out. We have, too, pictures of Egyptians reclining on chairs and fishing in these artificial lakes. At Karnak there was one such lake, but whether it was used for the convenience of the priests or served for certain religious purposes, we do not know. There is a good chance that whatever may be the secrets of this Karnak lake will shortly be disclosed. Mr. De Morgan, the most indefatigable and at the same time the most practical of Egyptologists, proposes pumping out the sacred lake of Karac, and at the latest date was at Assuan making his preparations.

Among the many thousands of objects discovered during the present year by Mr. W. Flinders Petrie and others, while excavating some thirty miles from Thebes, and now on view at University College, there is a pair of scales, which with the exception that they turn on a pin, exactly resemble those used in our pharmacies of to-day. The length of the beam is about four and a half inches, a ring at each end carries the original cords, which are three in number, and the pans, about the size of a penny piece, are slightly convex in shape; a small ring is attached to the top by which they may be held; the finish and workmanship are alike excellent. The exhibition closes, unfortunately, in a few days, but as the discoveries have been of an extraordinary character, another opportunity will no doubt be afforded later on to those who feel interested in the past to see the collection when permanently located. It is refreshing to find that in those distant days tipcats and tops were known to the boys, while the girls had their dolls, and the chemist manufactured pots of perfumed fat or unguent, which in one case at least still retained traces of its original odor.—British and Colonial Druggist.

Warren K. Moorehead, curator of the Ohio Archæological Society, has been opening mounds along the valleys of the Muskingum River and its tributaries, making some important finds, says the Cincinnati Commercial Gazette. A small mound on the Porteus farm, three miles south of Coshocton, was opened, in which five skeletons were found. These skeletons are of unusual interest to science, as they indicate the type of the prehistoric race. The skull is thicker than that of the negro, with low facial angles, prominent jaws, handsome teeth, and small brain capacity. The skeletons indicate a tribe somewhat shorter than ourselves, more muscular, and heavier. Near Walhonding, in a mound two feet high, was found the skeleton of a person supposed to have been the arrow maker of the tribe. Just above him were buried some sixty or seventy of his implements. These were made of flint, beautifully shaped, and about half the size of a man's hand. In a gravel pit near by was found the skeleton of a child, with mussel shells and other playthings. In a mound nine feet high, on the Johnson farm, were found a stone used for playing games, flint scalping knives, and a few arrow heads. There are a great many mounds in this valley, and it is expected that other valuable and interesting finds will be made.

With reference to excavations of the island of Philae, the Cairo correspondent of the Times writes: "The work of clearing the island of debris so as to permit a thorough examination of the ancient monuments, which was intrusted by the Egyptian government to Captain Lyons, R. E., will probably be completed shortly. The satisfactory discovery has been made that the foundations of the main temple of Isis are laid upon the granite rock, being in some places over 21 feet in depth, and the temple has nearly as much masonry below ground as above. The southeastern colonnade has also its foundations upon the granite, and, so far as excavated, they are curious, if not unique in design. They consist of parallel cross walls some meters high, but varying according to the slope of the rock surface, with large stone slabs placed horizontally upon their tops, and the pillars forming the colonnade are erected upon the slabs. The nilometer is marked in three characters—Demotic, Coptic, and another much older, probably Hieratic, of which a copy has been sent to Berlin for decipherment. A stela was found bearing a trilingual inscription in hieroglyph. No traces have been discovered of any buildings anterior to the Ptolemaic periods. M. De Morgan, Director-General of the Antiquities Department, is engaged upon repairing the great hall of columns at Karnak."

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## COLLISION WITH AN ICEBERG.

BY JAMES MURRAY, EX-M.H.A.

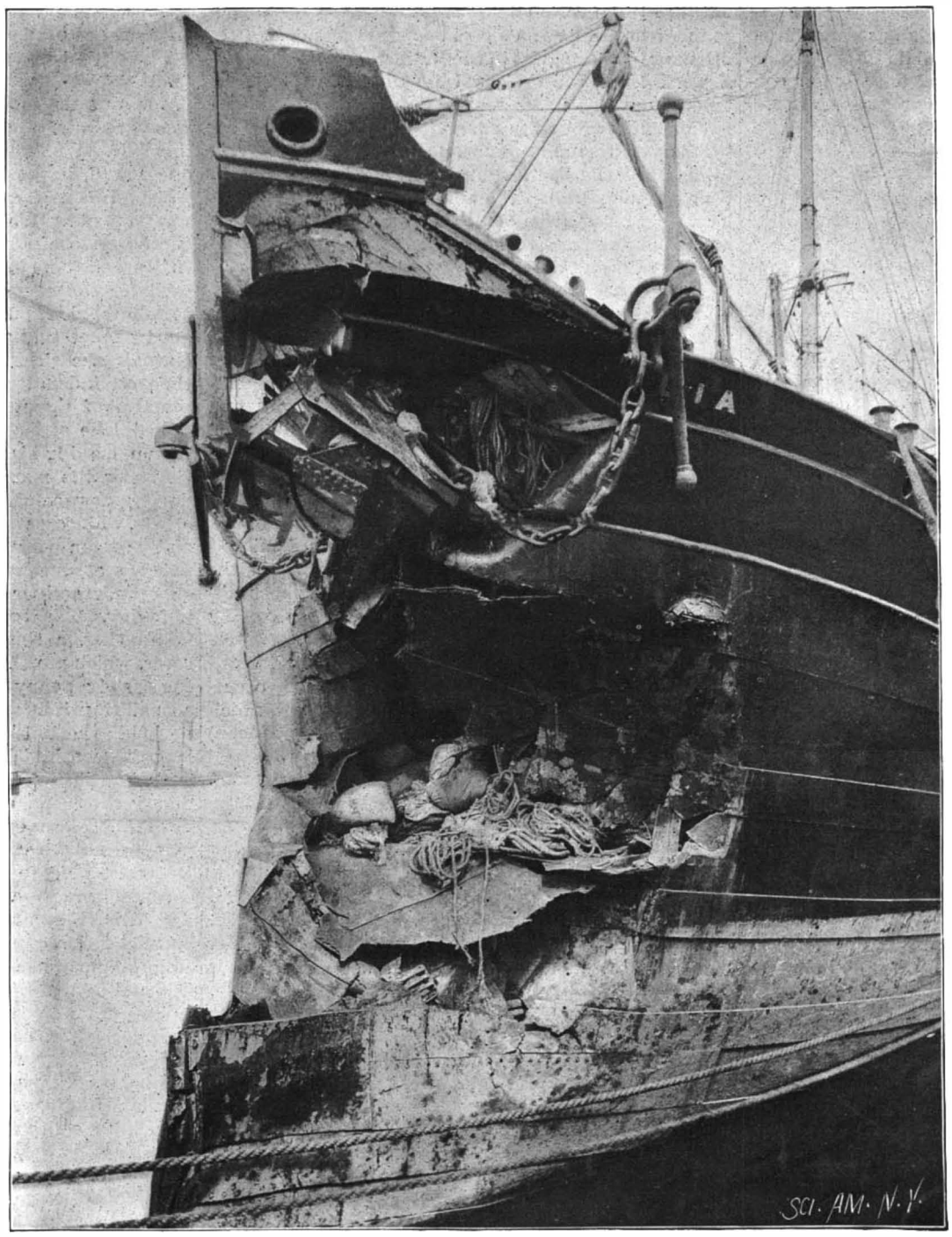
Owing to the unusually severe character of the preceding winter, the coast of Newfoundland has been unusually studded with icebergs during the spring and summer of the present year. About ten o'clock on the morning of Wednesday, July 22, the people of St. John's were rather surprised to see a large, strange steamer heading for the narrows of that port and evidently in distress. On being boarded she was identified as the Donaldson liner Concordia, bound from Montreal to Glasgow with a general cargo, including live stock consisting of 434 head of cattle, 6 horses and 391 sheep. She had left Montreal on the 16th instant, and on the following Sunday night, the 19th, when about thirty miles east of the Straits of Belle Isle, and while going about three-quarters speed through the fog, she descried a long, low-lying berg directly on her course; the first ice she had seen since leaving Montreal. The engines were immediately reversed, and when it was seen that a collision was unavoidable, set at full speed astern, with the effect of modifying to some extent the force of the terrible impact that followed; but notwithstanding all these precautions, the blow of the encounter was of tremendous force, as our illustration shows. The iron plates of the vessel's bow were bent in and back like so many sheets of tinfoil, and her massive frame crumbled before the inflexible ice mass like an eggshell. Fortunately for the safety of crew and cargo, the force of the blow was above the water line, and although some water obtained access through the forward bulkhead, the quantity was inconsiderable, and the ship's pumps were able to keep her free. Knowing his position, the captain at once shaped his course for St. John's, where he knew a commodious dry dock existed, and where, by steaming slowly, at the rate of about five miles an hour, he arrived without further disaster, and in less than thirty-six hours after the collision. On the Concordia's arrival she was immediately placed in the hands of the repairers, with the view of effecting such temporary repairs to the injured bow as would enable the steamer to continue her voyage across the Atlantic. These were accomplished with as much expedition as possible, without the necessity of putting the vessel on dock, so that the Concordia was able to leave again for Glasgow, which she did on Saturday, August 8, arriving safely at her destination nine days afterward, on the 17th, so that her detention on account of the accident was less than a fortnight.

The difficulty of dealing with the Concordia at St. John's was greatly enhanced by the fact that her deck was hampered with a large cargo of live stock of considerable value. The cattle being stall fed and designed for a special market, could not be pastured out, but had to be penned and fed in stores until the vessel's repairs were completed.

The iceberg collided with was one of the immense "table" bergs, having a flat surface like a floating field of ice, whose appearance is much less conspicuous than that of the pinnacled or castellated bergs. Not since the arrival at St. John's of the Guion steamer Arizona, eighteen years before, had a steamer which had sustained so severe a blow called into Newfoundland. In both cases illustration is afforded of how utterly powerless are the strongest steamships afloat to resist even a slight contact with the terrible iceberg.

Of course the nature of the accident to the Concordia was such that summer weather and smooth seas were greatly in her favor. In the case of the Arizona the breach had to be covered with an improvised shield or caisson until she reached St. John's.

The Concordia is a three masted steel screw steamer, schooner rigged, of 2,544 tons gross measurement and 1,617 tons net. She is 320 feet long, 41 feet broad and 25 feet deep. Her horse power is 296. She was built and launched at Glasgow in 1881 and classed A1 at Lloyd's.




STEAMER CONCORDIA INJURED BY COLLISION WITH AN ICEBERG.

### The Ashmolean Museum Struck by Lightning.

Oxford was visited a short time ago by one of the most serious thunderstorms experienced in the district for many years, forked and sheet lightning accompanying an almost tropical downpour. During the progress of the storm the archæological library of the Ashmolean Museum and University Galleries, situated in the northern block, was struck by the electric current. After a particularly vivid flash, smoke was seen to be issuing from the roof, and an alarm was immediately given, the fire brigade, under Chief Engineer Green, being on the spot within five minutes. The fire made rapid headway, and it was feared the priceless collections which the building contains, including pictures by Sir Joshua Reynolds, Turner, Ruskin, and the old masters, would suffer serious injury. Noting the gravity of the situation, Second Officer Symonds burst open one of the doors and got the hose up through the window. Meanwhile the keeper of the galleries, Mr. McDonald, M.A., did good service with the hand pumps kept on the premises. When the firemen reached the roof, it was found the flames had got a good hold of the wood and felt packing under the slates, but by the exertions of the brigade, who had an excellent supply of water, the conflagration was got under in marvelously quick time, and a number of willing hands having removed the valuable books, the damage was confined to the building itself. Members of the university rendered good service in this way, among others being the president of Trinity, the Rev. C. H. O'Daniel, Bursar of Worcester, and Mr. McDonald. There are four lightning conductors on the building, but the electric current struck a gable on which there was no conductor, and traveled along a lead gutter down a standpipe to the earth.—London Telegraph.

SHIPBUILDING ON THE CLYDE.—It is believed this year will be a record breaker in shipbuilding on the Clyde and northeastern coast of England. Thirty-three steamers with an aggregate displacement of 85,000 tons have been launched, and as many or more are in course of construction in the shipyards.

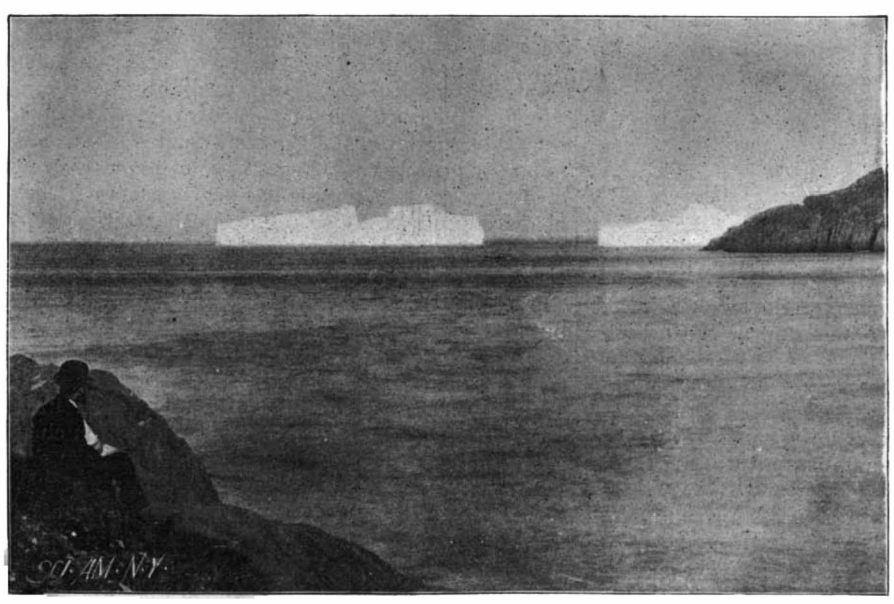
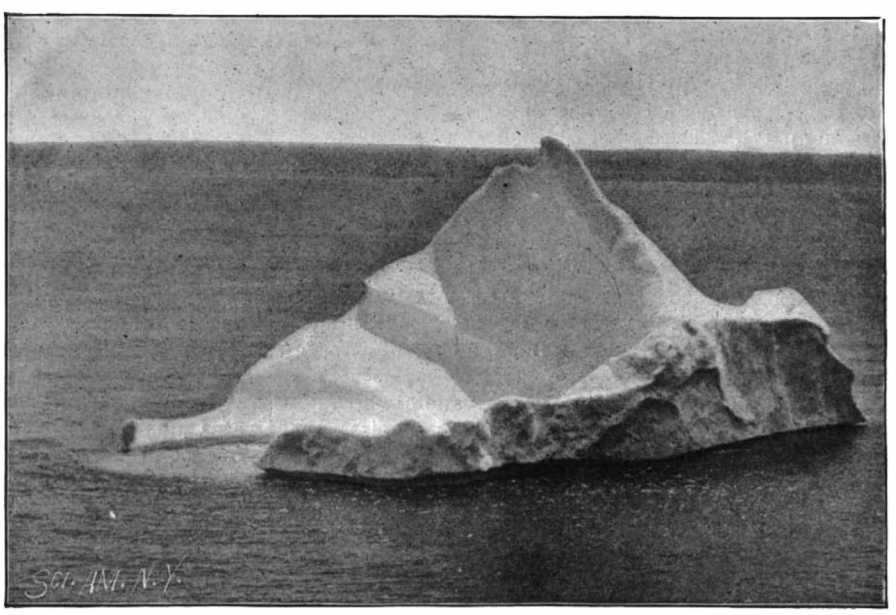



TABLE ICEBERGS, ENTRANCE TO NARROWS, ST. JOHN'S, NEWFOUNDLAND.




FLOATING ICEBERG OFF ST. JOHN'S, NEWFOUNDLAND.

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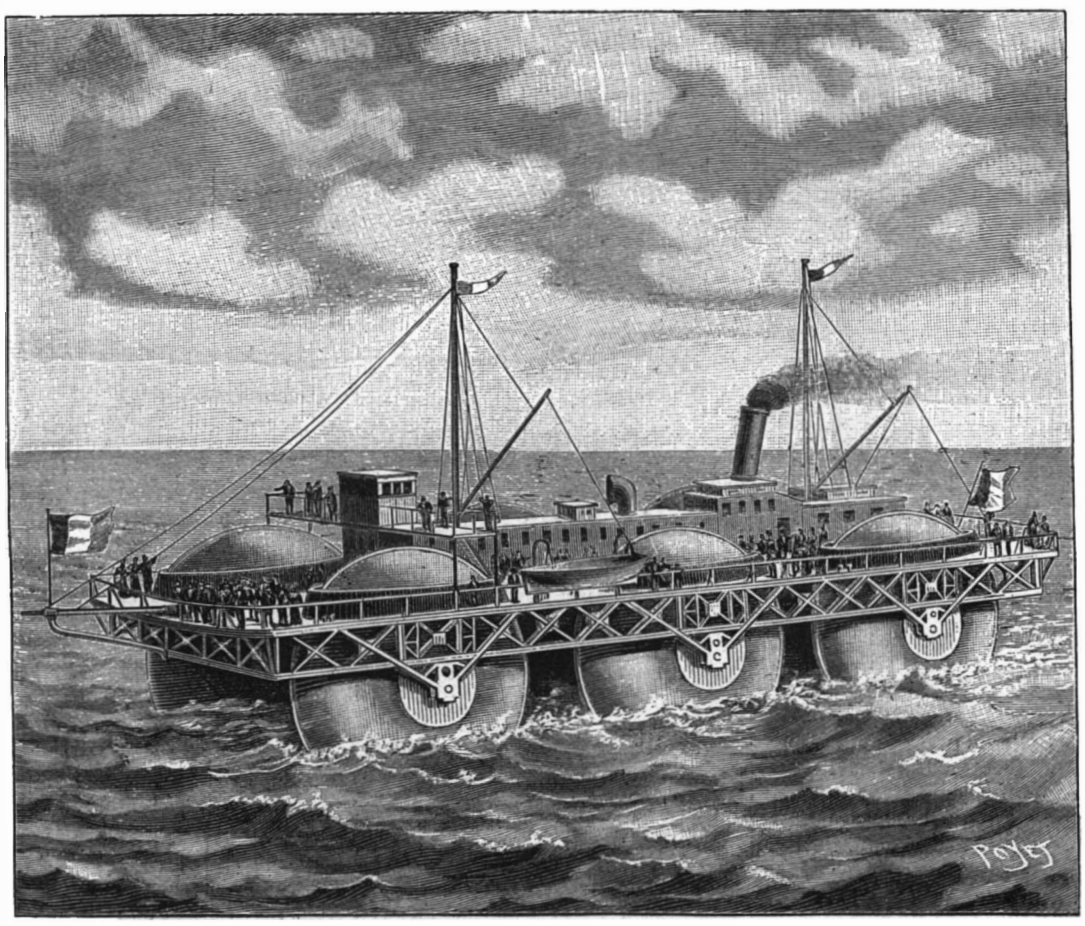
### THE BAZIN ROLLER SHIP.

Shipbuilding and naval circles are interested in a new type of vessel which has recently been launched in France. The Bazin roller ship, according to newspaper accounts, tends to revolutionize modern shipbuilding practice by the phenomenal speed allowed. The extraordinary vessel shown in our engraving was launched at the Cail dockyards on the Seine at Saint Denis on August 19. It is called the Ernest-Bazin, and, in brief, it consists of a rectangular iron frame or platform (carrying deck houses) about 120 feet long and 40 feet wide, mounted on six hollow lenticular rollers, each some 39 feet in diameter. The thickness of these rollers is about 12 feet. The shell or skin of the rollers is applied to strongly braced skeleton work which will prove effective against the crushing force of the waves. Only one-third of the roller is submerged. A 550 horse power engine actuates the screw propeller, which rotates in an inclined plane between the pairs of rollers.

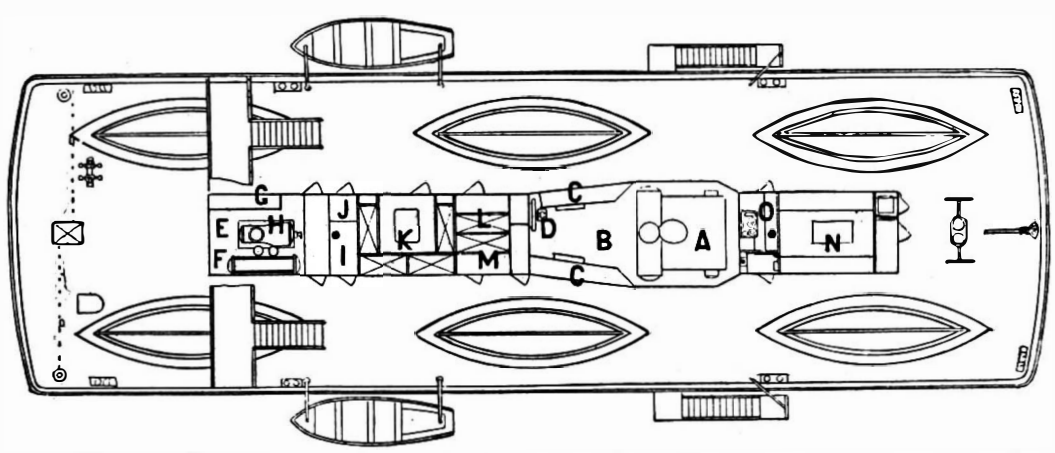
The rollers are connected together in pairs, each pair being actuated by a fifty horse power engine; so the entire set of rollers are actuated by engines aggregating 150 horse power. It is hoped that by the use of the rollers the friction of the water will be reduced to the minimum, it being the theory of the inventor that the boat should roll over the water without cutting through it. The strain is not longitudinal but vertical, and the inventor hopes that the "bite" of the roller on the water will be analogous to that of a car wheel on a sanded rail, only, of course, allowance being made for the mobility of the water.

The principle of the new boat may be readily understood by making a hollow lens-shaped roller out of tin, so that it will somewhat resemble two saucers fastened together. If this disk be plunged into the water and pushed forward, it will go ahead for some distance before being stopped by the resistance of the water; but if, before it is pushed along the water, it is given a sharp rotary movement by means of a spindle, it will be found that the disk will saw the water instead of beating it, and that it will cover several times the distance that the disk did when it was simply pushed through the water.

Speed is not the only advantage claimed for the new boat. It is said that the stability will be greater than in the present steamer, and in consequence the passengers will suffer less from seasickness, and it is claimed that the passengers will have more light and air. If the great speed is attained with these vessels that is anticipated, the length of voyages will be diminished, so that the consumption of coal may be lessened, and, as a natural result, passengers and freight will be transported at far less expense than heretofore. It is also expected that under the new system the coal economy will be very great, the inventor claiming that the use of his system will make a difference of one-half in the coal consumption. He expects that a transatlantic steamer built after his system can make 32 knots with a capacity of 10,000 horse power, and at the same time carry six hundred tons of merchandise more than the great ships Campania and Lucania, which make 20 knots per hour with engines which aggregate 30,000 horse power. The ordinary freight boats can, it is claimed, be run economically with a speed equal to our present fast transatlantic steamers. Of course, these views are not held by the average shipbuilder or owner. It is also asserted that the catastrophes at sea would be greatly decreased by the use of rollers. In case of collision or other accident, though some of the rollers might be damaged, some would almost certainly escape damage, and two would suffice to keep the vessel afloat and take her into port.



THE BAZIN ROLLER BOAT AT SEA.




A, boiler; B, boiler room; C, coal bunkers; D, ventilator; E, engine room; F, condenser; G, water tanks; H, engine; I, store room; J, lamp room; K, cabin; L, captain's stateroom; M, engineer's stateroom; N, saloon; O, galley.

DECK PLAN OF THE ERNEST-BAZIN.

His first experiments were made with a small model, the rollers of which were moved by clockwork, the propeller being replaced by a weight, which was attached by a string passing over a pulley to the front of the boat. When the rollers were not working the miniature boat took 22 seconds to cross from one side of the large vessel in which it was placed to the other side. When they were working it took only 11 seconds. As the power necessary to keep the rollers at work is only one-quarter of the power that is required to keep the screw going, the mathematical result is that the speed of the vessel is doubled by an extra expenditure of power which amounts to only one-quarter.

We are indebted to L'Illustration for several of our engravings. They present the leading features of the vessel and represent her before she was launched. It will be seen that the design of the vessel seems to be well adapted for the short, choppy sea of the English Channel, which is a classic spot for the trial of new types of vessels. The Ernest-Bazin will descend the Seine, cross the channel and go up the Thames to London. If the experiment is successful, a large transatlantic steamer, with probably eight rollers, may be constructed. At the present time the boat is chiefly interesting as a curiosity.

It would seem that if the present system were elaborated for more extended service that little space would be available for passengers or freight; but it is possible that the inventor intends to modify the design so as to meet these conditions. Whatever the outcome of the trial may be, the inventor deserves all credit for his perseverance and spirit in putting his ideas into practical shape for experiment, and the whole plan is so original that the results of the trial will be watched with the greatest interest.

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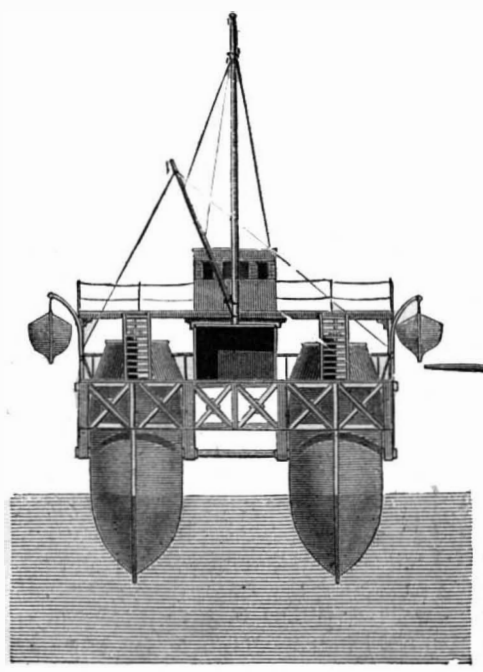
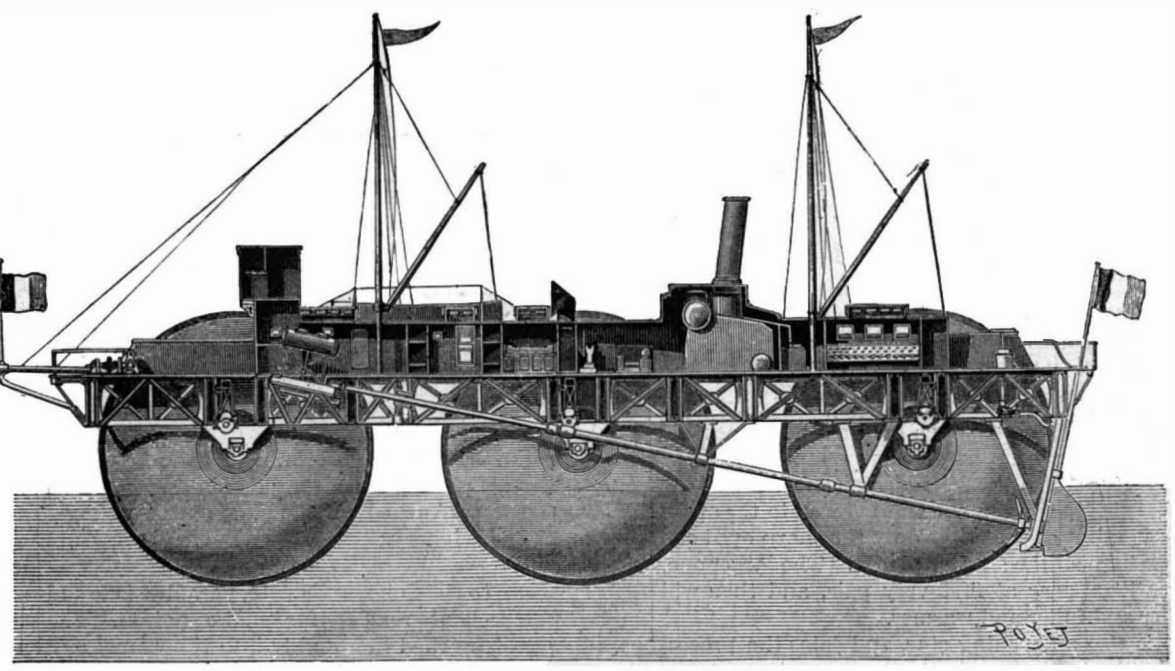
A STEEL wire fly wheel, twenty-five feet in diameter and requiring two hundred and fifty miles of wire in its construction, has been made in Germany.



BOW VIEW.



SECTION FROM BOW TO STERN.

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### In the September Sky.

The September sky will be alive with clustering constellations that shine with renewed luster in the crisp and pure autumnal atmosphere. Among them may be noted the great square of Pegasus rising in the east, and low down in the northeast is the lovely cluster of the Pleiades. The three stars, Arcturus, Vega, and Capella, known as the northern brilliants, are especially worthy of observation, for they are all visible, and opinions differ as to which is the brightest of the trio. At the close of the first third of the month Arcturus is the brilliant red star near the northwest horizon, and is at the terminus of a line from the North Star through the end star in the handle of the Dipper. Vega, the superb star, high in the north, not far west of the meridian, and Capella will be found in the northeast, outshining its neighbors. The three stars form together an irregular triangle. But planets and stars will lose their luster when toward the latter part of the month the almost full face of the harvest moon shines in the eastern horizon, just a short while after the sunset glow has disappeared, and rises slowly to the zenith, putting out the light of the fainter stars.

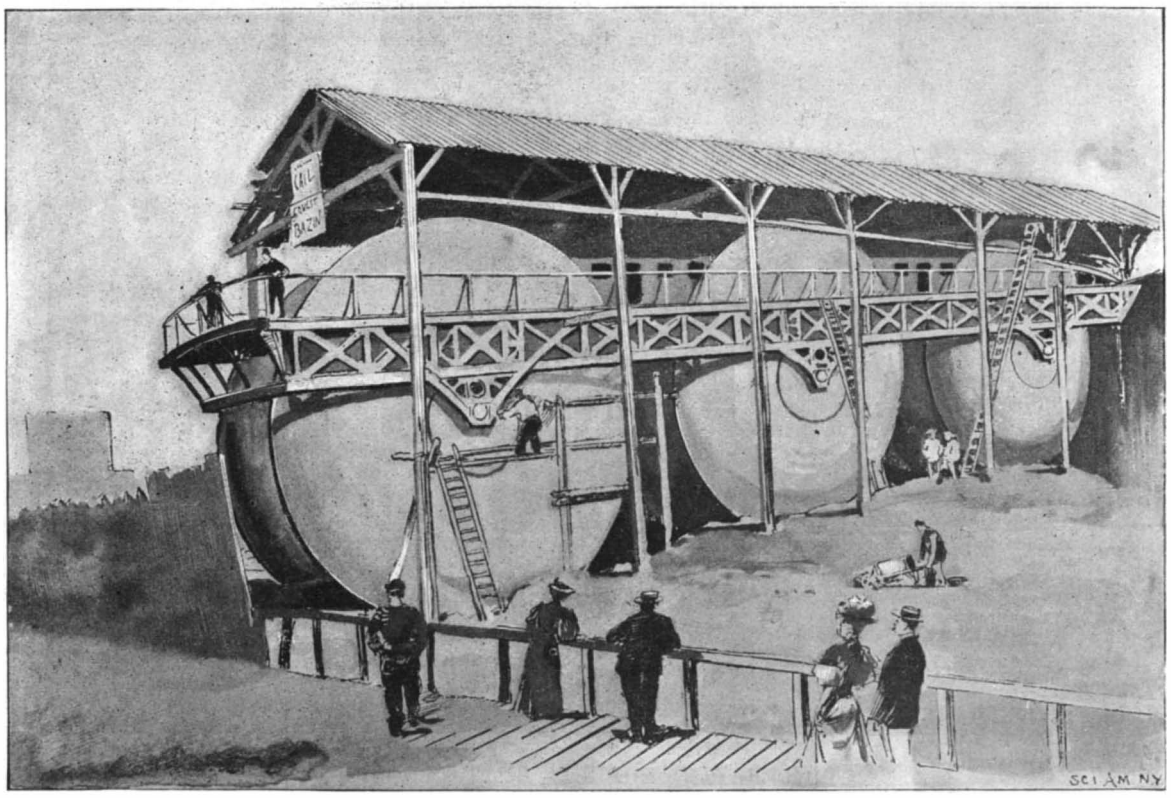
The September moon is new on the 7th and passes through the phase of quartering on the 13th. On the 21st it is full moon, a few hours in advance of the time the sun crosses the line, and astronomical autumn begins. The last quarter takes place on the 29th. The series of lunar conjunctions begins with Jupiter early on the 6th, and it is a very close meeting indeed, but the planet has been too recently in conjunction with the sun to admit of our seeing his face just at present, and so the human eye is not permitted to dwell upon what must be a beautiful picture. On the 8th Venus and the three days' old crescent are in line, but all too far apart to prove particularly attractive, although any tableau in which these two take a prominent part is well worthy our admiration. Mercury, on the 9th, is fairly close to the moon, and, as we can see this elusive planet on that night, it will be a somewhat rare spectacle, although there are more than two degrees of clear sky between the principal actors. Saturn's turn is next, on the 11th, and Uranus a few hours later the same day, but beyond a mere passing notice there is nothing to be said of these meetings. There is now quite a number of days intervening before the next meeting, which is with Neptune on the 28th, the list closing three hours later, with a meeting between the moon and the warlike planet.

Jupiter having been in conjunction with the sun about the middle of the last month, has now become a morning star, and will shortly assert himself as the most conspicuous object in the early morning sky, although just at present his whereabouts are not disclosed to the unaided human vision, owing to a too close proximity to the sun.

Venus has taken her familiar place in the western sky, where she can be seen shining among the ever changing sunset glow, not too brightly perhaps just at present, but giving promise of better things to come and cheering us with the assurance that she has come to stay as long as 1896 remains on the calendar. She wrested the sovereignty of the evening sky from Jupiter, whom she drove entirely out of her realm, and who will not again attempt to rival her this year.

Mercury on the 9th is in conjunction with the moon, and soon after the autumn sunbeams have ceased to dart their gay delights about the western horizon we can see the planet shining for a while above the line where earth and sky seem to meet. On the 13th the planet reaches his point of greatest distance to the eastward of the sun, which is 26 degrees 43 minutes away from that body. This is the last time for this year that the Mercurial pendulum will swing to the far eastward, so those caring to have a look at the planet will have to do so very soon or give it up until after the new year arrives. On the 24th Mercury, moving to the westward, is in line with Venus on her way in the opposite direction, but at that time only the sharp eyed can readily distinguish the smaller planet. The larger one, however, will appear at first very pale, and then will grow fuller and fuller and warmer.

Saturn is also an evening star, and joins the procession of brilliants that majestically move toward the west. The conjunction with Luna on the 11th is not deserving of more than passing notice, as there are almost eight degrees of clear blue between the two. Saturn is moving with accustomed dignity toward conjunction with the sun, where he will arrive in the early part of November, and after which he will be a morning star. In size and brilliancy, the wonderful ringed planet is gradually fading, and will continue so to do until after his period of transition from evening to morning star. Neptune is in quadrature, or 90 degrees away from the sun, on the 12th, on his way toward opposition, where he will be due in December.



LAUNCH OF THE ERNEST-BAZIN ROLLER VESSEL.

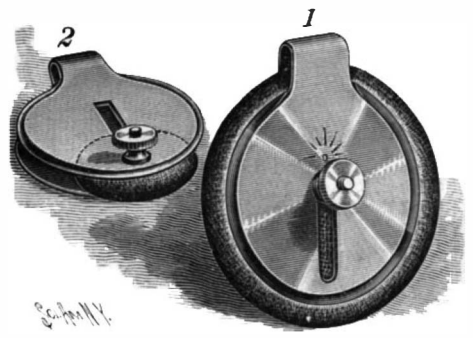
On the 24th Mars and Neptune are in conjunction, an extremely close meeting, which we are not permitted to see without instrumental assistance. Neptune is to be found in 5 hours 18 minutes right ascension and 21 degrees 42 minutes north declination, in the constellation of Taurus.

Mars is now about in quadrature with the sun, and is one of the morning stars. His size is on the increase, and in December, when he is in opposition, and we have him in sight throughout the evening, he will be a most striking and pleasing object to gaze upon. During September, beyond the minor events already alluded to, Mars is not very conspicuous.

Uranus may also be included in the last portion of the remarks upon Mars, as he is quite out of the running for the month, and is held in the grip of the Scorpion. —New York Times.

### A RUBBER ERASER HOLDER.

A simple device for holding circular rubber erasers, by which the eraser may be securely and firmly held




HENKEL'S ERASER HOLDER.

even when worn to a very small size, is represented in the engraving, and has been patented by Charles V. Henkel, of No. 590 East 136th Street, New York City. Fig. 1 shows the device in position when the eraser is new and of full size, and Fig. 2 when the eraser is greatly reduced in size, or nearly worn out. The holder has circular thin metal side plates in which are opposing radial slots adapted to carry a head or pin on whose other end is a screw clamping nut. The eraser has axial movement on the pin, and by moving the latter outward the center of the eraser is brought correspondingly near the edge of the side plates. The eraser may be freely turned on the pin and expose every portion of its periphery.

ACCORDING to the Cologne Gazette, paraffine is found to be an excellent remedy for snake poison. The paraffine oil is worked thoroughly into the wound and then allowed to stand on it in a pool or the bitten part poulticed with paraffine.

### The Products of Hawaii.

The island of Hawaii is the largest of the Hawaiian group, having an area of 4,216 statute square miles, an acreage of 2,500,000, and a population exceeding 27,000. It is situated between 20° 30' 19" north latitude. Its relative size to the entire group is five-eighths of all. Its population is about one-third that of all the islands, and probably more than that of Honolulu and the island of Oahu. In its natural resources, it has more than that of all the other islands of the group combined, having twenty-five sugar plantations in active operation, controlling over 100,000 acres of land, of which over 40,000 are in actual cultivation for sugar growing purposes. These plantations give employment to over 10,000 men and women, and produce an average of over 73,000 tons of sugar annually, of the average value of $3,500,000.

This sugar product is not far from one-half of the entire product of all the islands of the group. In addition to the raising and manufacture of sugar, some of the plantations have large stock and dairy interests, one, the Hutchinson Plantation Company, having over 3,000 head of stock; and the Kukaian Plantation Company, which breeds and raises the best of horses, mules, jacks, cattle, sheep, goats, hogs, etc., having a large herd now on its place. It also has a large dairy in connection with its other interests, in which are 500 cows, 150 of which are milked daily. This plantation has about 80 acres of coffee growing. The crop this year from 40 acres is estimated at 91,530 pounds of berries.—Hawaiian Commercial Journal.

### Recent Patent and Trade Mark Decisions.

Houston E. & W. T. R. W. Company v. Stern (U. S. C. C. A. 5th Cir.) 74 Fed. Rep. 636.

Damages for Infringement.—In action at law for infringement of a patent the damages recoverable are not restricted to actual damages, but evidence may be given of sales made to other parties and license fees collected as royalty. In such case a witness cannot be permitted to give his opinion as to what would be the fair, reasonable value of the right to use the invention. Where the evidence shows only three sales made more than ten years before the infringement complained of, while the device has been on the market during all the intervening time, it is not a sufficient basis to establish any market value for the patent, and hence nominal damages only can be given.

Excelsior Elevator Cord and Hatch Cover Company v. Foote (U. S. C. C. N. Y.) 74 Fed. Rep. 772.

Hatchway Covers.—The Fraser patent No. 278,528 for a combination of a number of doors, cords, or chains, a number of catches, and a connection between the catch of one door and the adjacent door, so that the closing of the latter will release the former and permit it to close, is held void as showing only mechanical skill in modifying and adapting pre-existing devices.

American Graphophone Company v. Amet (U. S. C. C. Ill.) 74 Fed. Rep. 789.

Graphophone.—The Bell and Taintor patent No. 341,214 for the combination with a grooved tablet having a sound record formed therein of a reproducer having a rubbing style loosely mounted so as to be laterally movable to adjust itself to the groove, is not void for want of invention.

Partial Infringement.—The above claim is infringed by a device having a loose joint that enables the style to follow in the groove of the record, which is used only with a sound record made by the patentee, because in the use of such device all the elements of the patented combination are employed and therefore the independent sale of such reproducer will be prevented.

Ex Parte Lunken (Com. Dec.) 76 O. G. 785.

Mechanical Patent no Bar to Design Patent.—A design patent may be procured on a thing that has been the subject of a mechanical patent, as the two patents relate to different features of a thing which could not be claimed in a single patent.

Utility of a Design.—The word "useful" in the statute relating to designs has reference to mechanical rather than purely æsthetic features in designs relating to machinery.

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### IRON PIERCED BY HAILSTONES.

One is justified in many cases in giving only a tentative belief to many of the big hailstone tales over which some travelers delight to spread themselves, says the St. James's Budget. A correspondent in Dholi, Behar, however, sends the indubitable proof of photographs to quite convince us and our readers of the terrible nature of the hailstorm which occurred in his district recently. The storm passed over the greater part of the districts of Mozufferpore and Durbungah, but it appears to have concentrated itself with special fury over the indigo factory called Dholi. Here the storm was terrific, even for tropical regions, the hailstones weighing as much as five ounces. On an average they were as large, if not larger than cricket balls. It can be easily understood that the damage done was great. Not a whole tile was to be found in the roofs, trees were uprooted, birds were killed, and general destruction wrought all round. What is more astounding, the corrugated iron roofing over many of the factory buildings was riddled as if it had been shelled by a battery. We can quite imagine, as our correspondent informs us, that no storm like it has ever occurred in the district. Hailstones have, however, had the same terrific force in Africa, a sample of corrugated iron pierced in a like manner having been recently shown in London.

### THE PROPULSION OF BARGES.

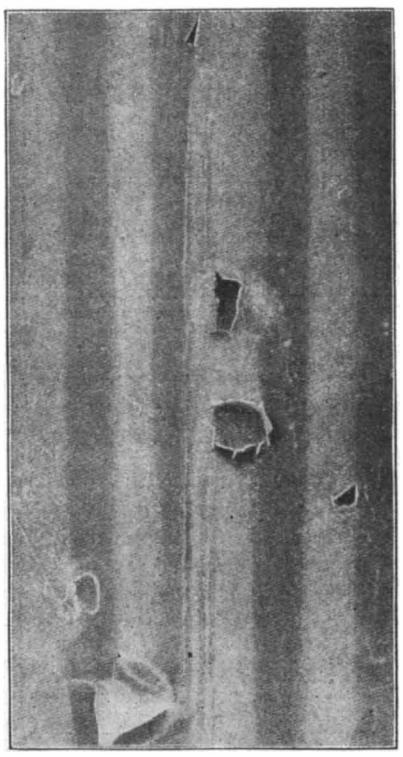
The propulsion of barges, especially upon canals, is not as yet effected in a really satisfactory manner. This is because multiple and special difficulties are met with. In the first place, it is necessary that the boats shall be able to run isolatedly, since the formation of trains is almost impracticable, generally speaking, by reason of the loss of time that it involves. Recourse to complicated methods of propulsion cannot be thought of, since the bargeman, who has no special education, must perform the necessary maneuvers without any trouble. It is indispensable, too, that the mechanical means adopted shall not introduce any modifications into the hull of the barge. Moreover, the propeller, if it be adapted to the hull, must not interfere with passages into locks or under bridges, and its weight or its installation must not cause any loss of the space reserved for the cargo. Finally, account must be taken of the fact that aquatic plants, so abundant in many canals, may interfere with the play of the propeller, and that the latter is capable of forming waves that are prejudicial to the proper preservation of the banks of the waterway.

For these various reasons and for several others, different methods of propulsion have been tried, such as the Levy or Oriolle cable system, the Galliot system of electric towing, etc. Mr. H. Barcroft, an English engineer, has just devised a method of propulsion by screws, but under very peculiar and very original conditions. While some have endeavored to place the screw upon the rudder, in elongating the latter, Mr. Barcroft arranges his propeller on each side of the rudder at the stern of the boat. In its installation, he has taken as a basis the principle enunciated by Rankine, viz., that the most efficacious propeller is the one that forces back the greatest volume of water at the feeblest velocity. On another hand, he has endeavored to make a removable apparatus that can be easily put on shore or be embarked and put in place without any change in the arrangement of the boat.

What adds to the interest of the invention is that it has withstood the test of practice. It is now more than a year ago that a boat provided with the arrangement in question was put in service upon the canals of the north of Ireland. This boat, which is called the Ulster, is now running upon the canal of the same name between Lough Erne, Lough Neagh, and the sea. This navigation is so much the more difficult in that the section of the waterway is often only double the transverse section of the boat, that there are many aquatic plants, and that billows are often encountered upon the lakes that must be traversed.

We present engravings representing the arrangement of the boat. Let us examine the barge Newry, which is 62 feet in length and 11½ in breadth and draws 5½ feet of water. With the motor installed it has an effective load of 65 tons. The motor weighs 6,600 pounds. It comprises a locomotive boiler with a heating surface of 87 square feet, and a horizontal engine with two cylinders 46 inches in diameter and having a stroke of 80 inches, the whole placed upon the deck without causing any real encumberment. As the axes of the cylinders are lengthwise, the shaft is breadthwise.

At each of its extremities it carries a helicoidal toothed wheel that gears with another wheel of the same



CORRUGATED IRON PIERCED BY HAILSTONES.

form placed upon a vertical shaft and carried by a frame fixed to the posterior part of the hull. The two frames are shown in Fig. 2. It will be remarked that they are provided with a supplementary frame, P′, designed to protect the blades of the screw against the shocks to which its situation might expose it. At the base of these frames the vertical shafts actuate the screws through bevel wheels. These screws have three blades, this number giving the best rendering with a suppression of vibration. The diameter of each screw is 4¾ feet, with a total surface of 24 square feet. The blades are of steel and their pitch is a little over 5 feet. At a normal speed the screws make 100 revolutions a minute. The hub of the screw, which is cast in a piece with the bevel wheel, revolves around a horizontal axle that carries the step bearing in which rests the lower end of the vertical axle. It presents an enlargement forming a collar that receives the thrust of the screw upon a surface of 8 square feet. The internal arrangement of the hub of the screw upon this axle and this collar is entirely analogous to that adopted for what is called the "patent" carriage axle. A constant bath of oil diminishes the friction to a considerable degree.

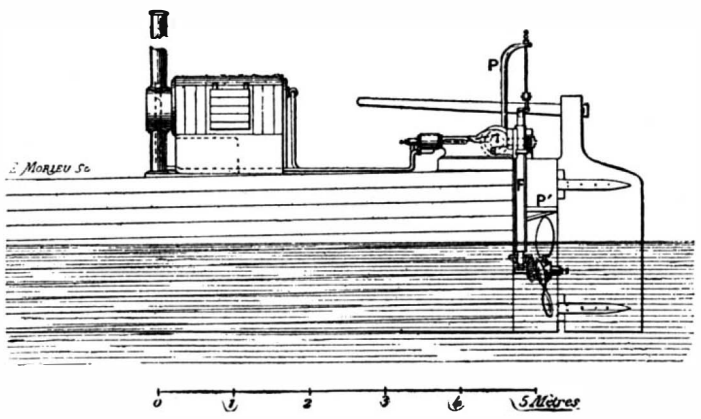



Fig. 2.—DIAGRAM EXPLANATORY OF THE BARCROFT PROPELLER.

As has certainly been remarked upon the first glance at the figures, the screws are far from being entirely submerged. This arrangement has been much criticised, since, in matters of maritime navigation, it is considered necessary that the propeller shall be constantly submerged, as otherwise it would, in its revolution, carry along a certain quantity of air that would by so much diminish the density of the liquid in which it revolves. But here it is a question of navigation upon canals, where there is practically no carrying along of the air, since the velocity of revolution is feeble, and where it is necessary to prevent the blades of the screw from becoming entangled with aquatic plants. Let us note, moreover, that the submersion of the screw is variable according to the pleasure of the bargeman. To this effect the vertical shaft is capable of rising or descending along the frame, F, in carrying along the propeller according to an arrangement frequent in many machine tools. This movement is obtained very simply by means of a standard, P, and a screw that is revolved by hand. Bargemen very quickly recognize the submersion that produces the best results for a given boat and maneuver correspondingly. For a draught of five feet, the lower part of the blades should be about forty inches beneath the float water line.

Upon a boat provided with this arrangement one man and a boy suffice as a crew. The steam engine may doubtless be easily replaced by a gasoline motor. In the trips made by the Ulster with a boat in tow and a total load of 107 tons, the usual speed reached is three miles an hour with a recoil of 11 per cent solely and a consumption of 275 pounds of coal for 13 miles. —La Nature.

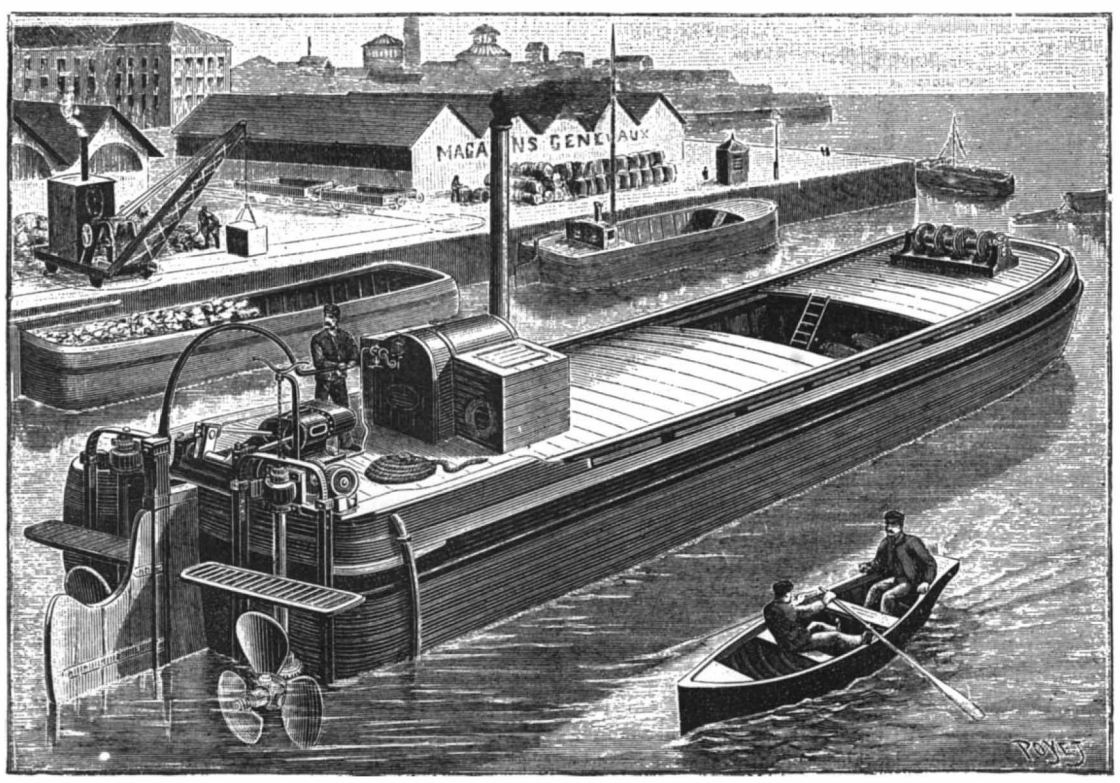


Fig. 1.—GENERAL VIEW OF A BARGE PROVIDED WITH THE BARCROFT PROPELLING APPARATUS.

### Proposed Polar Exploration.

The expedition to Jones Sound, planned for 1897, is intended to initiate a system of continuous Arctic exploration. Its object is to be the scientific research above indicated, and to this all else will be subordinated. Special attention will be paid to geology. Disasters having been plainly due to lack of a secure and always accessible base, the first object will be the establishment of a base at the mouth of Jones Sound, which Julius von Payer calls "the one spot most suitable for such a base." Being in assured annual communication through the Scotch and Newfoundland whalers, a well housed and well provisioned party, with some Eskimo families, will be as safe there as anywhere on earth, and will have before it a field unequaled in richness and extent. To the north, the west coasts of Ellesmere Land and Grinnell Land are to be explored; to the northwest, the triangle between those coasts and the Parry Islands is to be rescued from the unknown; to the west, the interior of North Devon is an interesting problem; to the southwest, Prince Regent Inlet may present an avenue to the magnetic pole; to the south, Baffin Land—with its Eskimo settlements, its herds of reindeer, its wealth in fishes and birds, its fossils and minerals—offers a tempting field, larger than the British Isles. Even Greenland may not be beyond the sphere of that strategic point.

Such a system, once initiated, will cost very little. Lecturing tours and the sale of collections will defray a large part of the cost. Considering the enormous sums spent on Arctic exploration in the past by governments and by individuals, it seems probable that when the system is once in running order it will not lack patrons. The cost of the initial expedition is estimated at five thousand dollars. Much smaller sums will probably suffice in subsequent years.—Robert Stein, in Appletons' Popular Science Monthly.

A LABORATORY for the examination of patients by the Roentgen rays has been established in Berlin under Prof. Buka, of the Polytechnicum.

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### Bequeathing Brains to Science.

A SOCIETY AT CORNELL TO ENCOURAGE THE PRACTICE—RESULTS TO BE GAINED.

The following form of bequest can be obtained by applying to Prof. Burt G. Wilder, Cornell University, Ithaca, N. Y.:

I, ———, now of ———, student of Cornell University from ——— to ———, and graduate in ———, recognizing the need of studying the brains of educated persons, rather than those of the ignorant, criminal and insane, in order to determine their weight, form and fissural pattern, the correlations with bodily and mental powers of various kinds and degrees, and the influences of sex, age and inheritance, hereby declare my wish that at my death my brain shall be intrusted to the Cornell Brain Association (when that is organized) or (pending its organization) to the curator of the collection of human brains in the museum of Cornell University, for scientific uses, and for preservation, as a whole or in part, as may be thought best. It is my hope that my family and friends may not oppose this my earnest wish.

Signature———

Date———

Witness———

In 1890, following the example of the French Société Mutuelle d'Autopsie, the American Anthropometric Society was formed in Philadelphia, says the New York Tribune, and Prof. Wilder was a member of the Publication Committee. The articles of incorporation of this Philadelphia society required that all brains should be disposed of at the headquarters of the society. From the first Prof. Wilder was not in accord with this restriction, and in December of 1891 he resigned, giving among others as a reason for his resignation: "My own circumstances and plans for investigation would preclude any such active co-operation as might naturally be expected. With hearty good wishes for the success of the society as a local or university organization for the increase and dissemination of important and accurate knowledge respecting the brain, I remain, etc."

On account of that love that still clings to the ashes in fond yearning, and in other cases a religious sentiment against mutilating that which was once the temple of the Holy Ghost, science has been restricted in its examinations of the brain almost entirely to criminals and insane people, of whom in life the world knew nothing. The Cornell Brain Association wishes to widen out the minds of people, and convince them that to have their brains preserved and studied is an honor to be coveted.

It pointedly asks: "Who can set a limit to the results that might have been attained from the examinations of the brains of soldiers like Grant, Sherman and Sheridan, of preachers like Beecher, Brooks and Howard Crosby, and naturalists like Agassiz, Gray and Jefferies Wyman; of lawyers like Tilden, Conkling and Benjamin Butler? How long must science wait for a general sentiment such as is embodied in the declaration of an eminent historian that science is as welcome to his brain as to his old hat, and that he wishes he had ten of them?"

The American Anthropometric Society at Philadelphia has the brain of Joseph Leidy, its first president; and the brain of George Grote, the historian of Greece, has been described by John Marshall.

The great need of average brains has been firmly impressed upon Prof. Wilder. Of this matter he says: "Another matter has impressed me more and more during the last year, namely, the need of a fissural standard based upon the careful comparison of large numbers of average, intelligent, educated and moral individuals, excluding the eminent as well as the immoral, the ignorant and the insane."

It is understood that in all cases, even where it has been the manifest desire of the defunct that his brain should be given to the Cornell Brain Association, should the near relatives object to the fulfillment of the bequest, such desires of the living shall be respected. At the present time most of those who are willing to devote their thinking organs to the services of their successors have been recruited from the ranks of the Cornell University in some way; they, the testators of brains for study and preservation, were graduates, members of the present teaching body or former professors. There are some others; among these are a brother and sister, orphans, who have no near relatives who might object.

Size of the brain, to be an indication of power, must be aided by other attributes. In substantiation of this, Prof. Wilder calls attention to two brains obtained by him in 1891, one from a lawyer and writer, the other from an ignorant black janitor. There was but little difference in the amount of fissuration. When fresh, the lawyer's brain weighed 1,225 grammes (43·20 ounces), the janitor's 1,250 grammes (44·09 ounces). The janitor was heavy and strong, the lawyer spare, though active. The lawyer was under thirty years of age, the janitor was in his ninetieth year.

Even the brain of the baboon that died in the Central Park managerie has contributed its not-to-be-despised quota to science, since its examination has to an extent caused science to qualify the statement that "the human brain is relatively heavier than that of any animal larger than a cat in which the cerebrum is fissured." This baboon died of tuberculosis, and his age was unknown. The keepers thought him to be about seven years old. But his post-morten examiners stated that "incomplete dentition indicated about two years." The body of the baboon weighed 5,738 grammes (12·6 pounds) and its brain 171 grammes. The body of the baboon is thus only 35·5 times as heavy as the brain. In healthy human beings the ratio is about 1 to 45.

### Trolley from New York to Philadelphia.

Mr. Frank A. Magowan and J. Henry Darrah, of Trenton, N. J., after nearly a year's hard work, have formed a syndicate of New York and Philadelphia capitalists to construct an electric railway between New York and Philadelphia, the distance being nearly 100 miles as the road runs. The New York and Philadelphia Traction Company has been formed, and associated with it is the Central Jersey Traction Company.

At the head of the enterprise is Mr. J. Canby, of Philadelphia, who has had much experience in traction railways. The syndicate for the traction road through New Jersey is not only formed, but stock has been transferred and a partial payment made to the promoters, Messrs. Magowan and Darrah, and John Blair McAfee, of Philadelphia.

Work upon the new road is to be commenced in a few days. A contract has just been given out for operations between New Brunswick and Bound Brook and Raritan and Dunellen which will amount to $475,000. A power house to cost $100,000 is to be erected near Bound Brook.

The New York and Philadelphia Traction Company was incorporated on July 13, 1894, with a capital stock of $10,000,000, by Frank A. Magowan, who took in the Central New Jersey Traction Company. There will be 1,000 miles of road, connecting nearly all the large towns of New Jersey.

The direct line of the main stem will begin at Paterson, where connection will be made with the present system. Then the road will pass through Upper Montclair, Montclair, Bloomfield, Orange, East, West, and South Orange, Maplewood, Wyoming, Springfield, Westfield, Fanwood, and Northwood, to a connection with the present system in Plainfield, and thence through Plainfield to Bound Brook.

Crossing the New Jersey Central Railway at Finderne, the road will continue through Hillsboro and Weston, and thence to Millston, Rocky Hill, Princeton, Lawrenceville, and Trenton.

Branches will run from Bound Brook to New Brunswick, Somerville, and Raritan; from Bloomfield to Irvington, and to Morristown, via Chatham and Madison. At Irvington connections will be made with the existing lines, making a direct route to Newark and Jersey City.

From Westfield the road will run to Rahway, connecting there with the line to Lebanon and Boynton, South Beach, Woodbridge, and Perth Amboy. From Rahway the line will go to Elizabeth, and a branch will connect Bound Brook with New Brunswick.

From Trenton, the road will pass through Morrisville, Bristol, Cornwells, Terresdale, Tacony, Holmesburg, and Frankfort, and thence into Philadelphia.—The Electrical Engineer.

### How do Rains and Winds Spread Epidemics?*

Prof. Charles Mayer, as quoted from the Tennessee Journal of Meteorology, says:

"Occasionally epidemic diseases seem to have been spread by clouds and the rain from them. The best authenticated case is that of a plague epidemic in the fifteenth century, which broke out most violently in a Swiss town immediately after a cloud, coming from an infected but distant region, discharged its rain upon that town."

The relations of the weather to the spread of epidemics are still involved in great obscurity. Without going back to the fifteenth century, there was an excellent opportunity to investigate the subject in 1889–90, when the grip spread over the whole civilized world. Its progress was so regular that for a long time there was a general belief that the active germs of influenza were carried as dust in the air by the winds, or perhaps by the upper currents. This idea was dissipated by several memoirs that established the fact that the wind and weather were entirely subordinate factors and that the spread of the disease followed the lines of travel, especially the principal steamboat and railroad routes, and that, therefore, the germs were carried by diseased individuals or by articles that had been used by or had come in contact with them, and not by the winds. Of course the wind, in the narrow sense, may have carried the germs a few feet or rods from one individual to another, but not for distances of many miles. Several epidemics, such as the yellow fever, smallpox, and cholera, have been traced back to the direct importation of their contagia (whether animate or inanimate) by human agencies. Furthermore, it appears probable, from experimental data, that few disease germs can maintain their vitality more than a few hours when freely exposed to the air and sunshine, as would probably be the case if they were carried in the atmosphere as minute particles of dust. Therefore we think it probable that the winds and the rain must not be considered as the means by which diseases are spread between places that are any considerable distance apart. The limit to which living germs can be carried in the free air is not yet accurately known, but is believed to be quite small. The upper currents of air carried the vapor dust from Krakatoa, in 1883–84, over the whole Northern Hemisphere, but many months were required to do this, and what little we know of the life history of disease germs teaches that they could not survive the sunshine, the dryness, and, perhaps, the cold of the upper currents. This is not to deny that the winds and the ocean currents can carry the coarser seeds of plants and fungi for many miles without injury; but the bacterial disease germs have a far more delicate organism than those seeds, and what would seem to be an allowable analogy between the transportation of seeds and germs fails when applied on a large scale. The wind may carry the germs to a great distance in the free air, but probably will kill them in so doing; local breezes may carry living germs a few hundred feet, but the diseased man or the convalescent, or the clothing and articles used by these, or the water we drink, or the food we eat, may carry them hundreds and thousands of miles. In the particular case of the spread of the epizootic and influenza epidemics of 1872–73 among horses and cattle it was shown that they spread against the wind, or when there was a calm, quite as often as they spread with the wind.

The following extract shows the result of an extensive investigation by the medical department of the Prussian army into the spread of the grip epidemic of 1889–90. It illustrates what we have above said and shows that we must not exaggerate the influence of the lower winds or the upper currents:

"If we now collect together the results of experience as to the spread of the grip in the German army, we find that the view still holds good which prevailed at the beginning of the epidemic to the effect that the influenza is a disease that owes its origin to certain miasmatic external causes. On the other hand, there does not appear to be any sure evidence of the influence of weather, climate, wind, or soil, or the season of the year. To the contrary, the number of those cases in which the spread and the mode of spreading of the grip is to be attributed to human intercourse is considerably increased by the experience of the last epidemic. It is not yet clear whether in this intercourse there is a direct carriage of the infectious material from person to person or whether the infection is carried by the intervention of inanimate objects through the air. We are still ignorant of the real germ that causes the disease. A correspondent from Bavaria gives the following example, which leads him to believe that inanimate substances may house the real germs of the disease and carry them far away. The medical officer of the garrison at Germersheim, at a time when as yet not a single case of grip had occurred at that place, received a package from a place in Russia at which the disease prevailed severely. A short time after opening this package he fell sick of the grip, and soon after also his whole family. If it should be further demonstrated that dead substances can thus contribute to the spread of the disease germs, then perhaps in this way we shall explain the appearance of the disease upon ships on the high seas. The germs attached to the cargo carried by a ship can, by spreading among the seamen, give rise to a violent, sudden outbreak of the grip."

* Prof. Cleveland Abbe, in Monthly Weather Review, August, 1895.

### Gen. Casey's Skill in Estimates on Engineering Work.

The skill shown by the late Gen. Casey, chief of army engineers, in estimating in advance the cost of engineering will be better appreciated when we recall the errors made by others in similar calculations. The estimated cost of the Manchester ship canal was $28,750,000. Nearly $80,000,000 was spent before the canal was ready for business. The international commission reported in 1856 that the cost of digging the Suez canal would certainly not exceed $40,000,000. It had cost $94,500,000, to say nothing of Egypt's gratuitous building of lighthouses, dredging of the harbors, advance of money without interest, and gift of forced labor, the whole amounting to $20,000,000 more. Engineers spent a year collecting data for their report on the Congo railroad, which, they asserted, could be built for $5,000,000. They now say that the total cost will be from $12,000,000 to $13,000,000. The egregious underestimate of the cost of the Panama canal nearly swamped that enterprise before wholesale stealing completed the ruin. The forts on the Meuse River, estimated at $4,500,000, cost $16,000,000; the Corinth canal cost $12,000,000, instead of the estimated $6,000,000; a harbor and a railroad on the island of Reunion cost $13,500,000, instead of $6,800,000; the Senegal railroad, which was to be completed for $2,600,000, absorbed $9,000,000; and the Langson railroad in Tonkin, which was to open a conquered province for an expenditure of $500,000, bled the French treasury to the tune of $4,367,790.—Army and Navy Journal.

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## RECENTLY PATENTED INVENTIONS.

### Engineering.

FEED WATER HEATER.—George T. Munday, Brenham, Texas. This heater has an arrangement of distributing troughs so located as to evenly distribute the water over tubes in thin streams or a thin sheet, to quickly heat it, the construction being such that the tubes and troughs may be easily removed for cleaning purposes. In operation the live steam circulates freely through the tubes, heating the water nearly to the temperature corresponding with the boiler pressure, any scale forming on the outer surfaces of the tubes falling upon a wire cloth screen from which it may be readily removed.

CARBURETER.—George G. Schroeder, Washington, D. C. This is a portable apparatus for carbureting atmospheric air by easily vaporizable liquid hydrocarbon or oil, the body of the apparatus resembling ordinary gasometers forming a part of gas plants, and consisting of an air receiver and gasholder of adjustable capacity. In its lower portion is a packing of sponge or other fibrous material which temporarily holds the liquid hydrocarbon and through which air is drawn and then forced back again, to form gas suitable for illumination or heating. The sponge or equivalent material is chemically treated to produce a superior quality of permanent gas, and the application of heat is unnecessary and entirely dispensed with.

### Railway Appliances.

CAR COUPLING.—Philip Bogler, Alamosa, Col. This is a coupling of the drop pin and link type, adapted for the automatic coupling of two meeting cars, and permitting of conveniently uncoupling them from either side without having the trainmen go between the cars. A gravity block is pivoted in the chamber of the drawhead, which has top and bottom openings, the block having a forwardly extended toe, a recess adapted to hold the uncoupled link, and a table flange that is perforated to drop the pin when the block is rearwardly rocked, and sustain the pin at the rear of the perforation when the block is forwardly rocked.

ANGLE COCK.—William J. Waldron, Fort Worth, Texas. To prevent tampering with the air brakes of any car of a train, or the turning off of the air at the rear end of the tank of the engine, without first having the release made by the engineer or some one in charge of the engine, this inventor has devised an improved angle cock, and also provided a locking device adapted for attachment to the bottom of any angle cock or valve now in use. A handled valve or plug turning in the angle cock has an opening in its bottom in which is adapted to enter the piston rod of a locking device connected with pressure under control of the engineer and independent of the train pipe.

### Electrical.

ELECTROLYTIC APPARATUS.—Charles W. Fielding, London, England, and Louis B. Walker, Elizabeth, N. J. To facilitate the separation of precious metals from base metals, and to separate from metals generally foreign metals or materials, this apparatus has, in combination with anode and cathode plates, spherical blocks of non-conducting substances, there being upper and lower blocks, the upper blocks of a pair having a flexible connection engaging over the top of the plate and the lower blocks being suspended from the upper blocks. The blocks bear at one side against an anode and at the other side against an adjacent cathode, and each cathode is placed in close contact with an anode, so that no electrolyte in the tank can pass between them.

ELECTRIC WIRE SLEEVE CONNECTIONS.—Samuel Olsen, New York City. To facilitate the twisting of these connections this inventor has devised a tool that may be operated with a back and forth movement, similar to that of a ratchet wrench, thus avoiding the complete circular movement necessary with the tool commonly employed in this work. The movable jaw is automatically drawn toward the other jaw by a spring, and extended outward from the shank are push pins, which the operator presses against with his thumb or finger to release the tool from a sleeve and secure a new hold.

STEAM GAGE.—John O'Connor and C. A. Turner, New York City. This steam gage is arranged with a dial over which an index travels to indicate the steam pressure in the boiler, and an electric contact is arranged in the path of the index, including an electric circuit and an electrically operated device controlled by the closed circuit. The excessive rise or fall of the steam pressure in the boiler will be at once indicated and an alarm sounded, and on the excessive rise of pressure the valve or damper will be opened to reduce the draught through the chimney.

BOILER ALARM.—The same inventors have devised an alarm to give warning of the excessive rise or fall of the water in the boiler. In a cylinder having its upper and lower ends open to the boiler adjacent to the water level rises and falls a float, there being at the upper and lower ends of the cylinder stems adapted to be moved outwardly by pressure from the float, and these stems engaging contacts which include an electric circuit and suitable alarm devices. The device is very simple and inexpensive, readily applicable to boilers of various kinds, and is capable of adjustment to sound the alarm at any desired water level.

### Mining.

CONCENTRATOR.—Patrick H. McGowan, Denver, Col. This concentrator is for working all valuable minerals having greater gravity than their gangue, especially free milled gold, ores from stamp mills, auriferous gravel or sand placer dirt. The pan has a bottom of annular steps descending toward the center, where there is a discharge opening, each step having at its inner edge a standing flange or dam, while a rotary disk has depending agitators over the steps of the pan, a conical distributer forming the top of the disk and a feed hopper opening upon the distributer. Each of the annular steps is provided with readily removable receptacles containing quicksilver.

### Mechanical.

LUBRICATOR.—Clarence W. Nash, Union Bridge, Md. This is an oil cup in which the feeding of the oil is effected by the intermittent opening of a valve automatically operated by the momentum or centrifugal action of the valve when mounted on the wrist pin of a crank or other revolving part. Within a suitable casing adapted to be screwed upon a wrist pin or other support is the oil cup, extending centrally through which is a sleeve and nut through which slides a valve stem projecting above the top of the nut and carrying a conical valve below, playing between its seat in the casing and the superposed lower end of an adjustable stop sleeve.

STONE DRESSING MACHINE.—James M. Malone and James D. Perkins, Marble Hill, Ga. This is a machine of strong and simple construction, to dress stone for forming columns and provide them with straight or twisted flutes on their peripheries. The machine is in the form of a planer on which reciprocates a bed above which is an adjustable tool carrier, there being spindles in bearings on the bed to support the stone, as well as a rack and mechanism for revolving one of the spindles, the rack being held stationary during part of the stroke of the bed.

EMBROIDERING MACHINE.—Arsène Carpentier, Caudry, France. This machine permits the application of the Jacquard mechanism with perforated cards to the automatic operation of the frame for carrying the fabric, and dispenses with the special attendant to guide or operate the pantograph in reading the design, enabling the production to be augmented and rendered more economic. A reciprocating actuating frame is movable independently of the work holding frame, but may be coupled therewith, and movable droppers of different width are arranged between the actuating frame and a reciprocating operating device to control the extent of the reciprocating movement of the actuating frame, there being mechanism for selecting the droppers.

SHEET METAL SEAM.—Gustavus F. Bauman, Louisville, Ohio. For sheet metal stove pipes and similar articles this invention provides an improved seam of such a kind that the operator may readily close the sides of the article so that the seam will not be exposed to the heat passing through. It is an external longitudinal closing seam terminating near its ends in a lock seam, one of the members having an inwardly and backwardly turned flange engaging a slot in the inner portion of the other member, and the springy nature of the sheet metal drawing the two members into proper position after engagement.

LAST.—Arthur M. Leighton, Everett, Wash. This is an adjustable last for cobblers, especially adapted to facilitate repairing boots and shoes, fitting varying sizes and widths and the contours or indentations of the insole produced by the feet of the wearer. It has an adjustable toe plate and heel piece, with an intermediate part having pivotal connection with the toe plate and notched connection with the heel part, there being also a detachable bunion piece and various other attachments.

### Agricultural.

LANDSIDE FOR PLOWS.—George C. Christenson, Newberg, Oregon. According to this improvement, the landside is made with a bottom edge whose heel is beveled upward and rearward to form a fulcrum for swinging the plow in a vertical plane when bearing on the handles. It is designed to give the plowman better control of the plow and prevent it cutting too deep into the ground when plowing on hills or uneven ground, and also to make it easier to pass the plow point back into the ground when the plow jumps out, as in ground having roots, rocks, etc.

### Miscellaneous.

VULCANIZING WOOD.—John T. Lloyd, New York City. To prepare wood with a compound of creosote and other antiseptics to resist animal or vegetable attacks, this inventor has devised a treatment which consists in subjecting the wood in a closed chamber to the direct action of a still or stagnant body of live, wet steam, at a temperature of from 325° to 500° F., whereby the substances contained in the wood are converted into insoluble antiseptic compounds, which are held and permanently fixed in the fibers by the steam pressure, carbonizing of the wood being prevented.

FIFTH WHEEL.—Samuel K. Paden, Pulaski, Pa. This is an improvement on a formerly patented invention of the same inventor, according to which the skeleton upper part of the fifth wheel has a recessed circular rim and a flat diametrical bar with an annular boss projecting downward from its center, there being parallel flanges projecting upward from the sides of the bar and parallel vertical reach flanges having a web or bottom bar all constructed integrally. The improved construction gives great strength to the center of the upper part of the fifth wheel when it is most required, and the upper and lower parts turn freely on each other and may describe a complete circle, although held firmly together by clips.

VEHICLE WHEEL.—Alexander Pinover, New York City. To make a very strong wheel, particularly adapted for bicycles, tricycles, etc., and a wheel in which new spokes may be readily inserted in place of broken or bent ones, is the object of this invention, according to which the hub consists of two similar conical shell portions, the base portions of the two sections having grooves, and when secured together, forming sockets for the ends of the spokes, which are held in place by screws. The spokes are preferably tubular, and their outer ends are seated in metal sockets or thimbles in the wooden rim.

CORNER IRON FOR FRAMES.—Matthew Lynch, New York City. This is a flat triangular plate having two integral depending flanges, each corner iron having an oblong aperture whose edges slightly converge, and adapted for engagement by a stud on either end of a connecting link. The improvement is especially adapted for stiffening the corners of light wooden frames supporting scenery on the stages of theaters, and for detachably locking together any desired number of such frames when required.

LEVELER AND GRADER.—Daniel W. Jones, Salt Lake City, Utah. The frame of this machine is carried by front and rear rollers, and on the frame are posts which support a top or seat beam. A lever beam carrying at one end a scraper is pivoted between the rear posts, and treadles are connected with the front end of the lever beam where they may be pressed on by the feet of the driver, to bring the scraper hard against the ground. The scraper is adjustable by means of chains to different angles, thus making a grader, and the scraper may be removed and replaced by other tools such as rake heads, markers or furrowers, etc.

MEAT HOLDER.—Charles P. Loughridge, Nevada City, Cal. This is a simple and durable device, more especially designed for conveniently and firmly holding a ham while cutting slices or sawing a bone, without danger of the ham slipping or moving on the table. It consists of a frame of two metal plates adjustably held on each other and formed with downwardly extending flanges at one end to engage the sides of the table, the other end of one plate having an upward bend to engage the side of the ham, while a pin on the other member engages the shank of the ham and yet permits of conveniently shifting it as desired.

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**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(6952) J. E. S. says: There is a worm or borer working in the tops of trees in some of the apple orchards in this section; it gnaws off the limb square, so that it drops over. We found one limb with a hole in the heart extending up. Upon splitting the limb with a knife we found the worm. I send section of the limb containing the worm, also other samples of limbs cut off by the worms. Will you please tell us, through the columns of the SCIENTIFIC AMERICAN what the worm is and how to destroy it? A. Answer by the United States Department of Agriculture. Upon examination the twigs prove to be infested with the common twig pruner, known scientifically as Elaphidion parallelum. There is no perfect remedy against this insect, and the best plan will be to collect and burn the twigs as soon as they fall, in order to kill the worms which they contain. It will also be a good plan to cut off from the trees and burn all the twigs which show the least sign of infestation.

(6953) T. W. L. T. asks if amalgamated zinc will resist the action of a bichromate of potash solution. Will amalgamated zinc have the same effect as plain zinc in battery for temporary lighting purposes? A. The zinc is attacked and will be soon dissolved in great part if left in the solution. Always use amalgamated zinc; plain zinc is quite unsatisfactory and dissolves rapidly by local action, evolving a disagreeable odor and mechanically disseminating acid in the form of fine spray.

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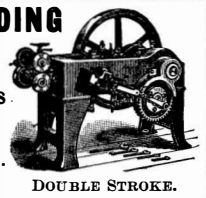

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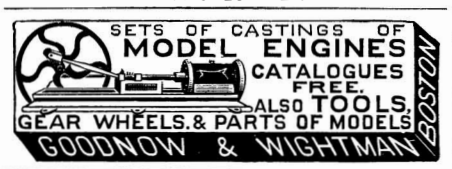


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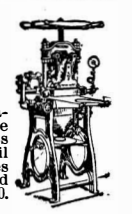

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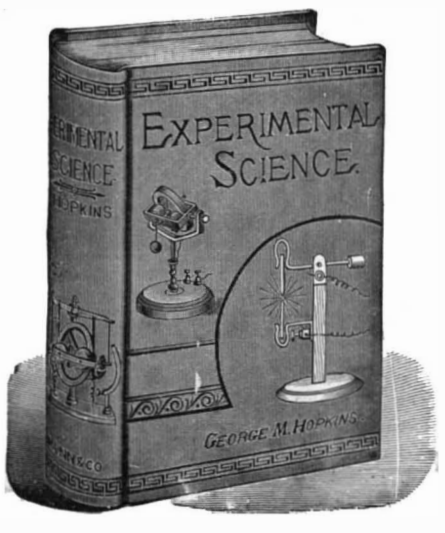


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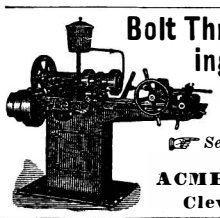

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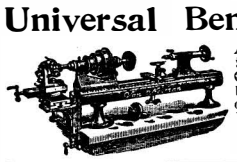

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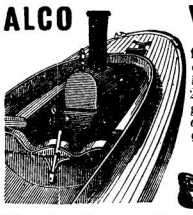

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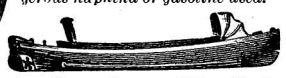

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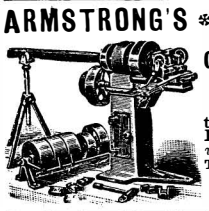

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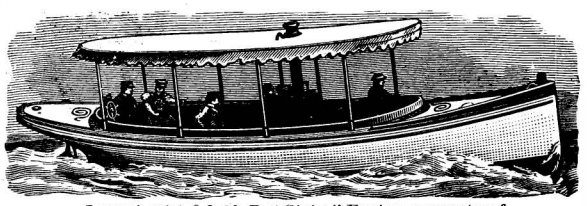

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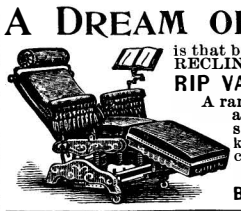

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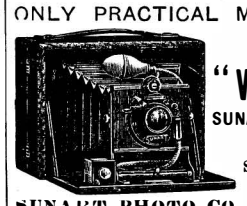

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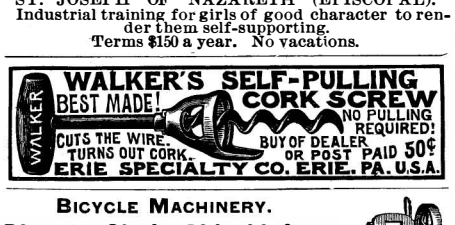
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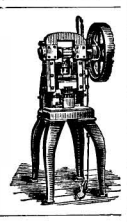

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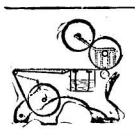

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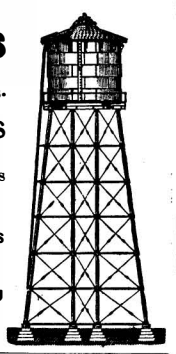

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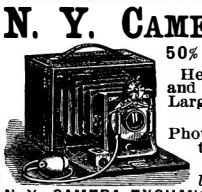

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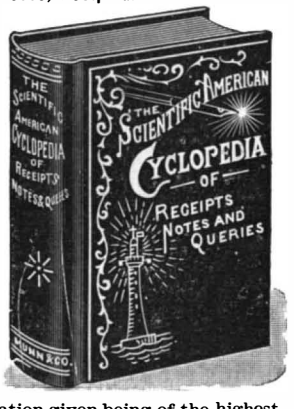


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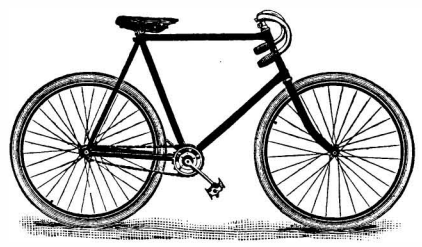

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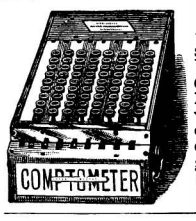


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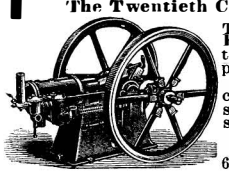

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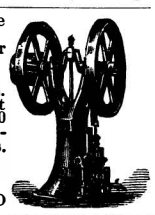

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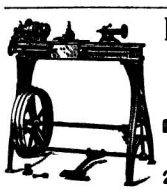

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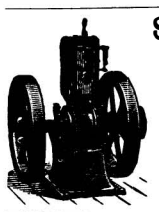

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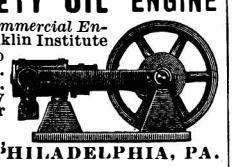

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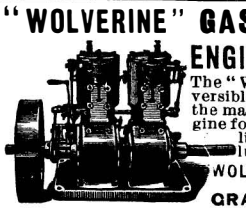

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